THE MARINE REVIEW

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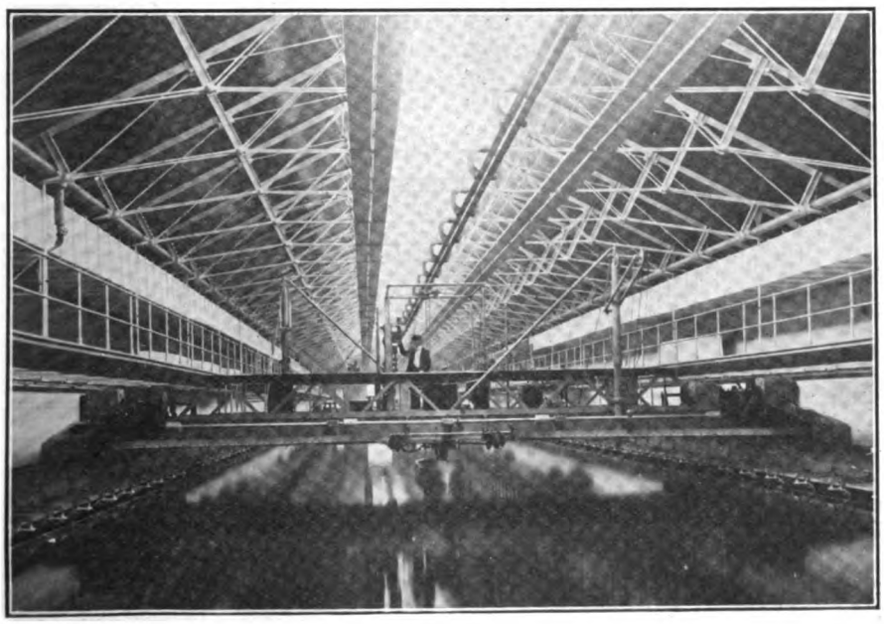
Model Experimental Tank

What the Navy Department is Doing to Prove the Theory of Suction as Well as Improving the Lines of Ships

By Day Allen Willey

THE suction of the current caused by the submerged portion of the hull of a warship or an ocean liner, as it leaves or enters the dock, is of such power that frequently the cables fastening vessels to piers have been broken and collisions have resulted, sinking or damaging one or both vessels which have been thrown against each other.

This is why the testing basin designed and constructed by the navy engineers for determining the speed of naval vessels and best designs of hulls, which will allow the cruiser or battleship to be propelled over the water with least resistance, has attracted much attention among ship builders in this country and abroad, since the miniature model of a merchant vessel could be made for the same purpose.



GENERAL VIEW OF THE TANK, SHOWING THE MODEL MOVING, THE MACHINERY FOR GAGING THE SPEED, THE RESISTANCE TO THE WATER AND OTHER TESTS

The reason this new idea was designed was the result of an investigation of a collision, made by Naval Constructor David W. Taylor, in connection with other engineers. The steamers Prinzess Irene and Parima were going out of New York Bay.

The Parima, the smaller craft, was leading, and the Prinzess Irene, gathering speed, began to overhaul her. The ships were in a comparatively narrow channel, and their courses, separated them laterally, by about 200 ft. Suddenly the Parima's stern was drawn toward the overlapping craft, when a wave caused by the suction of the Irene's rapid speed, threw the Parima against the Prinzess Irene and caused this ship to run aground. The seeming mystery of that mishap was proved by Naval Constructor Taylor to be due entirely to reactions set up between the ships by their own wave motions, and the same effects would be caused if the craft were virtually stationary and the tide were sweeping by them at a corresponding speed.

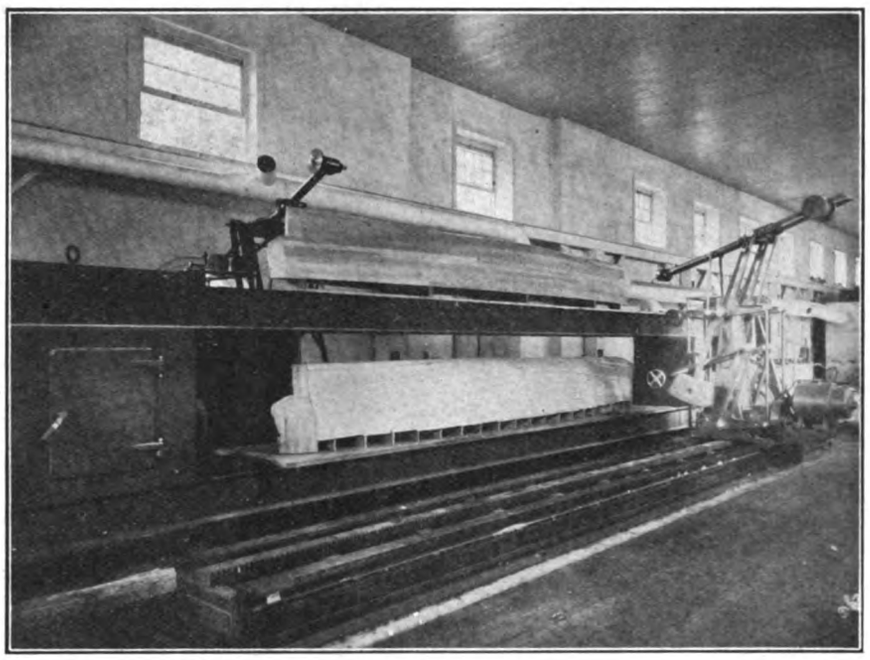
The experiments at Washington have shown clearly that the tendency between ships passing each other, as far as 200 ft. apart, or a vessel entering the harbor near the end of the pier that forms its entrance, creates a current either forward or backward according to the tide, the flow of the current depending upon the sizes of the vessels and their speed or the velocity of the harbor current. This shows how necessary it is for ships to pass further apart as they increase in size, speed and length; and it naturally follows that the course of smaller vessels would be thrown out of line by the movements of the craft of larger dimensions and greater depth.

Study of Currents

The study of currents is made by the employment of what is known as the "experimental model basin". The capacity of the basin is about a million gallons. It is filled with water from the city supply for Washington, which is taken from the Potomac, some miles above the city. Before reaching the basin, the water is treated with a minute quantity of alum, which coagulates with any mud present, and then clarified by passage through a sand filter of the pressure type. When working the filters to their full capacity, the operation of filling requires about a week unless the city water is unusually muddy. After filling the basin, a small stream

is kept constantly running through the filters in order to freshen the water, make up for leakage, waste, etc.

The basin can be pumped out in four hours by a 12-in. centrifugal pump, electrically-driven. Two other pumps are also installed, and both electrically-driven. One is a 4-in. pump, connected with troughs on each side of the basin just at the surface, by which the water can be "scummed". The other is a three-throw plunger pump, having a capacity of about 75 gallons per minute. This is used for drainage and piped to take the water from inside or outside the basin as desired.



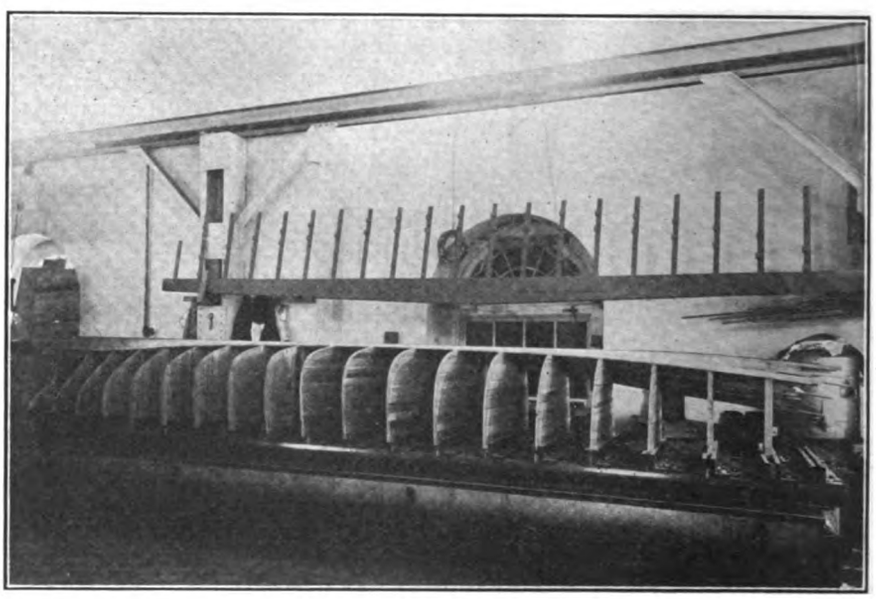
A COMPLETED MODEL OF A WARSHIP READY TO BE TESTED IN THE TANK

The troughs on each side already referred to, which are of steel, about 12 in. square in sections, and just below the usual working level of the water, act very efficiently as absorbers of wave disturbances. In addition, there is at the northern end of the basin, a "wave-breaker", consisting of a large number of square strips of wood, set vertically at varying distances apart. These in combination with the side troughs give entire satisfaction; any wave motion set up by a run of a model subsiding into minute ripples. Without wave-breaking appliances it would be a very lengthy operation to make trials at high speeds, as very long waits between runs would be necessary in order to allow subsidence of waves.

The apparatus for determining the resistance of models is all placed upon the traveling carriage spanning the basin. This carriage weighs about 70,000 lbs., and hence has sufficient inertia to give an appreciable flywheel action resisting sudden variations of speed. Four motors drive the carriage, one on each corner. The speed is controlled by electrically operated "brakes". Current from an "exciter" generator at 110 volts is used to keep constant excitation in the field coils of the motors. Current from the same exciter is passed through the controlling rheostats on the carriage and also around the field coils of the main generator.

The main generator is kept running at constant speed by a governor, which limits variation of speed within, 1½ per cent from no load to full load. The generator armature is in series with the motor armature, so that all the current developed at the generator passes through the motors, the voltage at the generators varying according to the amount of excitation of the generator fields, which is controlled from the carriage. The result in practice is to give the carriage accurate speed control and regulation. The maximum speed of which the carriage is capable is about 20 knots, developed in a run of about 200 feet.

With such a heavy mass moving at this speed in a confined space it was necessary to devise the arrangements for stopping with the utmost care. A very powerful electrical braking effect is obtained from the driving motors, through the back current which they generate when the exciter current from the generator is shut off or reversed. This enables the carriage to be stopped more rapidly than it is started, and in practice works very well. But this method of stopping could not be relied upon alone, since it would fail if the circuit is broken accidentally or by the automatic circuit breakers in case of an overload. This method also necessitates proper manipulation on the part of the person operating the carriage. It is necessary for this reason to have at least one method of braking which shall stop the carriage in the minimum possible distance, be independent of the electric current, and require no manipulation, on the part of the person operating the carriage. Friction brakes closed by hydraulic pressure were finally chosen.



FRAMEWORK OF THE MODEL OF A PROPOSED CRUISER

At the north end of the basin is a pair of iron strips on each side, securely anchored at one end to the main concrete supporting walls of the

building, and pressed together by hydraulic cylinders. These strips are 6 in. by 1½ in. in section. They are 15/16 in. apart when the pressure is on and 1-1/16 in. apart when it is off, being pulled apart by springs when the pressure is released. A strip of iron, about 1 in. thick and 12 ft. long, is securely bolted to each forward corner of the carriage, and is adjusted so that it enters without shock the space between the stationary strips, and by its friction against them brings the carriages to rest.

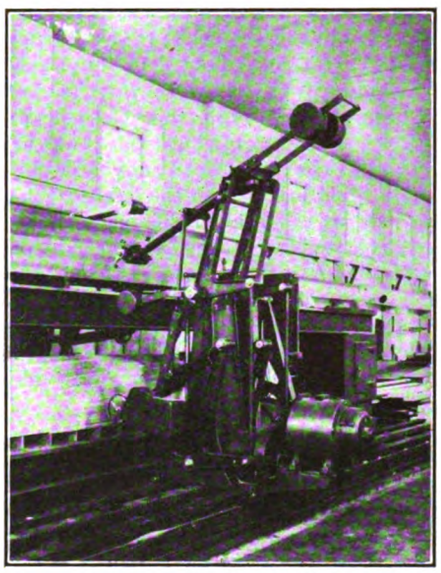
Hydraulic pressure is obtained from an electric pressure pump, and an accumulator is fitted, through which the pressure can be varied from 100 lbs. to 600 lbs. to the square inch. Gages at the south end of the basin, one on each side, indicate the pressure in the hydraulic cylinders, enabling the operators of the model to be certain, before a test, that the friction brake has pressure on. All the strips are kept well lubricated in order to avoid "seizing" or violent shock.

Emergency Brake

The apparatus was designed for a maximum pressure of 600 lbs. to the square inch, in order to make ample allowance for all contingencies, and also for uncertainty as to the exact coefficient of friction which would be shown by the apparatus. It is found, however, that a pressure of 300 lbs. is sufficient to bring the carriage to rest from its maximum speed.

As a final provision for safety, there is fitted what is called the emergency brake, which grips the carriage if in any way it gets through the friction brake without being arrested. The emergency brake is a longitudinal section of the brake on one side. The carriage engages a large hook connected by heavy cables and a taper piston rod to a piston working in a hydraulic cylinder. The taper piston rod passes through a round hole in the cylinder head which it gradually closes as it moves, the principle being identical with the well known hydraulic recoil brakes for heavy guns. The hydraulic cylinder is below the water level when the basin is full, and when this is the case the emergency brake is always ready, there being no moving parts or adjustments required.

Models are, so far as practicable, made of a standard mean immersed length of 20 ft. The length over all is usually somewhat greater. The model-making apparatus is designed with a view to working originally from the plan of the warship, cruiser or battleship which the model represents in miniature. Having received or prepared a correct body plan upon a certain scale, the first step is the determination of sections of a 20-ft. model, corresponding to the sections in the warship plan. For this an enlarging pantograph or eidograph is used. It works upon a table covered with a single sheet of thick glass. Having properly adjusted the length of arms by means of the scales provided, the pointer on the short arm is run around the sections of the body plan, the pencil on the long arm describing the sections desired, upon pieces of paper. These paper sections are used as patterns, from which are cut out corresponding wooden sections. They are clamped in their proper positions upon an iron table, and a skin of strips of wood nailed securely to them and smoothed off. This completes the "former model", as it is called. Its ends are not made to accurately represent the vessel, as it has been found preferable to rough finish only from the former, the ends of the final model and then get them out by hand.

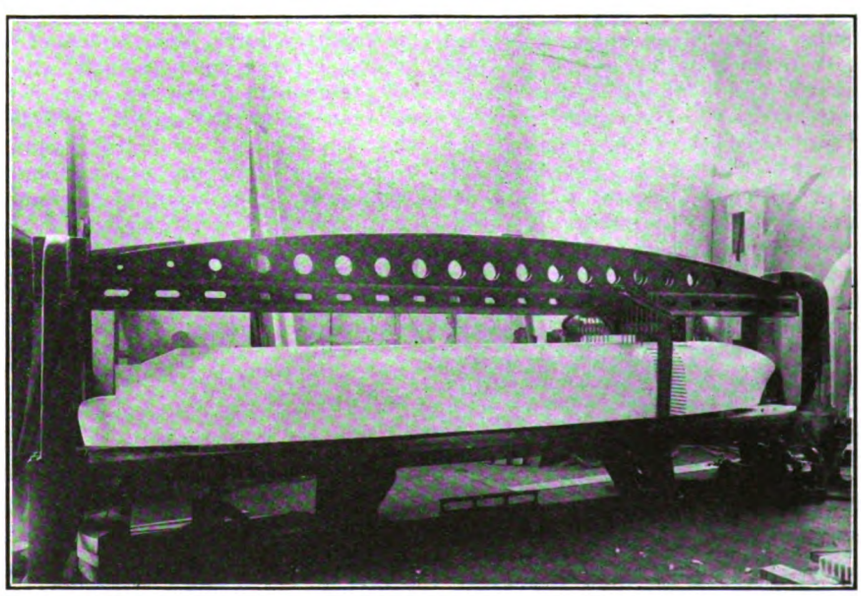


THE ELECTRIC MOTOR WHICH HAULS THE MODEL ALONG THE TANK

Simultaneously with the construction of the former model a wooden block is built up of white pine, about 2 inches thick, glued together hot under heavy hydraulic pressure. This block is so proportioned that when the finished model is cut from it, the wood will be left amply thick, nowhere less than about 2 inches. Additional thickness is not avoided since the models require ballast in every case.

The former model and its corresponding block are now secured in the model cutting machine. The roller below rolls over the former model, and the saw above, which is driven at about 2,200 revolutions per minute by an electric motor, is constrained by the balanced link work to move exactly above and at a uniform distance from it. The sizes are so arranged that the saw does not cut within one-eighth of an inch of the intended finished surface of the model. Then the superfluous wood is knocked off and a rotary cutter substituted for the saw, with a corresponding roller.

This cutter rough-finishes the model, which is then removed from the machine and finished by hand, the ends, which are left quite rough, being also shaped by hand from paper patterns or light wooden templets obtained from the lines. Sanded disks, driven at a high speed by an electric motor, are found to be very efficient and sat-



POLISHING THE OUTSIDE OF A MODEL SO THAT ITS SPEED CANNOT BE CHECKED BY THE ROUGH SURFACE WHEN BEING TESTED IN THE TANK

isfactory smoothing instruments. The models are carefully painted inside and out, and a standard varnish finally applied to the outside. Before being taken to the basin, the models are carefully measured by the apparatus. From the results of measurement another plan is drawn and compared sufficiently with the original lines, to insure that the model accurately represents the ship. All calculations at the model basin are made from the actual lines of the models.

All Trials by Weight

All trials are run primarily by weight, draught being used only as a rough check. Before beginning a trial, a model is suspended to one of the cranes shown on the carriage, and weighed. It is then ballasted until its weight in fresh water corresponds to the desired displacement of the ship represented. After a trial the model is check-weighed again when the ballast has been removed. In making the tests for speed and other data needed by the engineer a dynamometer is attached to the carriage, which runs to and fro on rails above the water.

The model has vertical plates attached to it in the center line at each end, which play with very little freedom between pointers rigidly attached to the carriage. The result is that with practically no friction the model is constrained to move in the same direction as the carriage and without deviation, while at the same time it is perfectly free to rise and fall, or change trim. The towing rod takes the resistance of the model, the fore and aft motion of the model, relative to the carriage, is very little.

The speed recording drum is arranged to have sheets of paper, about 16 in. by 22 in., secured to it somewhat as paper is secured to an ordinary indicator drum. The drum is mounted upon a shaft running from end to end, which ordinarily can be turned by hand by means of a wheel. Mounted loosely upon this shaft is a worm wheel, which is connected to the main driving shaft, revolving with the wheels of the carriage. An electric clutch seizes or releases the worm wheel by throwing its current on and off, so that when desired, the drum can be thrown into gear and driven at a speed proportional to the speed of advance of the carriage.

Pencils moved by magnets record upon the drum time and distance. The time pencil is connected with the break circuit chronometer and notes down every second upon the drum. The distance pencil records contacts with pins spaced along the track 30.4 ft. apart. This distance of 30.4 ft. is 1/200 of a knot, a knot being taken as 6,080 ft. The length of record corresponding to 10 seconds of time is measured on a special scale, which gives at once the speed in knots. Paper with metallic surface is used upon the drum, and the "pencils" are pieces of brass wire.

In the dynamometer proper, the spring is connected at its rear end to the swinging cross-head, which is suspended by a rod, about 4 ft. long, and so arranged as to swing very freely. A pin runs through this cross-head, over which the towing rod jaws fit loosely. The cross-head moves in the guide, rigidly bolted to the fixed bracket. Its travel is about ¾ in. between positive stops. At the extreme end of the rod, just below the cross-head, are electric contacts adjustable and usually set so that they are made on either side just before the cross-head reaches the positive stop, which is also adjustable.

The forward end of the spring is attached to a screw, which is again secured to the lower end of the traveling bracket. Attached to this traveling bracket is the arm carrying the record pencil, which then marks upon the drum the exact position of the traveling bracket, and thus determines the position of the forward end of the spring. The rear end of the saddle is fitted with horizontal and vertical knife edges engaging horizontal and vertical surfaces on a pin attached to the lower arm of a bell crank lever. This is balanced upon knife edges and carries by means of the scale beam a scale plan. It is also attached to the auxiliary beam, which is connected by double pivots to the pointer, which records upon the drum the position of the rear end of the spring. The distance up from the knife edge center to the line of action of the pointer being 5 ft. 6 in., while the distance down to the line of action of the spring is 2 ft., it will be seen that the motion of the pointer exaggerates the motion of the rear end of the spring in the ration of 2.75 to 1.

Adjusting the Apparatus

The process of adjusting the apparatus is as follows:

Before putting in the spring, by means of the balance weights upon the bell crank, the cross-head is brought to its central position, and care is taken that the cross-head swings in this position whether the pin securing scale pan rigidly to the scale beam is in or out. The position of the auxiliary pointer is then noted. There are fitted to mark upon the drum, when desired, a number of fixed pencils, such as which can be set to record at any position. One of these, called the auxiliary zero pencil, is set so as to indicate always the position of the auxiliary pointer when the cross-head is central and everything balanced.

Next a spring is slipped into place and a corresponding back weight. The record pencil is then brought to a convenient position for zero of the main scale, and a scale pencil set to mark this zero. By adjusting the screw forward or back, as may be required, the auxiliary pointer is brought back to its zero. When this is the case, the back weight gives the spring a certain initial tension by means of the saddle and cross-head, while at the same time the cross-head is swinging freely in exactly its natural or zero position. The scale pan is allowed to swing freely, and a weight of 10 lbs. placed upon it. This extends the spring until the cross-head brings up against the positive stop. The bracket is then screwed forward by throwing the motor in gear until the auxiliary pointer again comes to zero. A scale pencil is set to mark the position of the recording pencil. Twenty lbs. is now placed upon the scale pan and equilibrium again restored by screwing the traveling bracket forward. The scale pencils such as now record upon the card lines, which correspond to extensions of the spring, measuring 10, 20, 30 and 40 lbs. The weights are removed, the recording pencil returned to about its zero position, the scale pan clamped in its zero position and the work of adjustment and calibration, which is done more rapidly than described, is complete.

Starting with Lower Speeds

The model is then attached by the towing rod, which transmits to the spring only the horizontal pull upon it, the resistance of the model being all in a horizontal plane. It is customary to start a series of runs with the lower speeds and work up by degrees to the highest speeds, plotting roughly the results as they are obtained after each run. In this way, knowing the speed of a run about to be made, the approximate corresponding resistance can be calculated accurately—and it is the practice to set the record pencil approximately at this position before making the run, so that the automatic appliance may be called upon to traverse it as short a distance as possible.

These tests are to obtain accurate data as to the vessel which is to be placed in service; to show the least pull or resistance at the desired maximum speed. The actual speed of the model is in a mathematical ratio of the relation between this miniature and the full-sized ship. After a model of satisfactory form has been developed and tested, then comes the further

task of making the figures of the trials applicable to the intended ship.

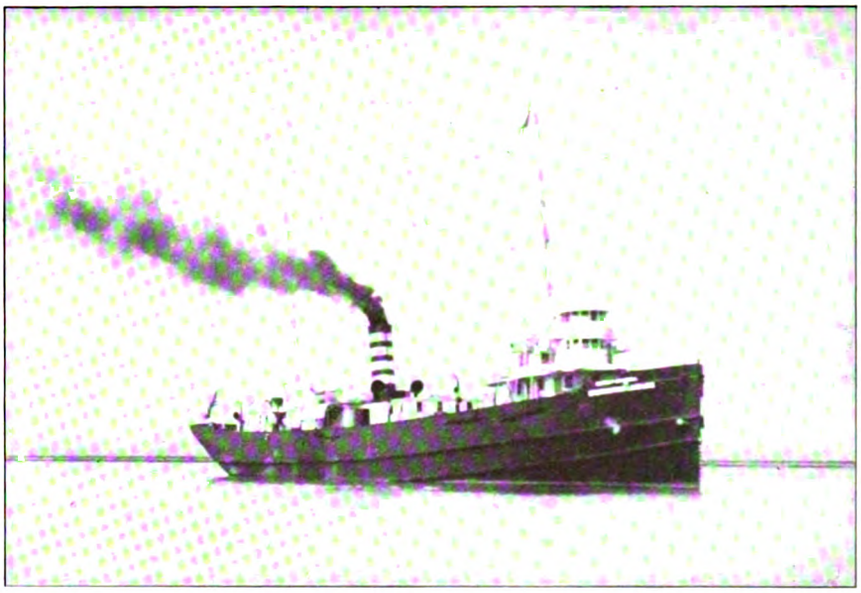
From these two tests, that of the plane and that of the model, the designer has the correct information he needs, so that the naval architect knows both the maximum and the cruising speeds at which the vessel can be propelled most economically. The cruising speed is an important one, because it is at this rate of travel, that ships of war move frequently. Full speed is really a battle reserve to be called for only when urgency demands.

As a proof of the great saving in the cost of warships may be given illustrations of a vessel built from data obtained from the model tests, and one constructed merely from drawings, will suffice. Among the vessels in the fleet is the gunboat Nashville, designed in 1894. She has a displacement of about 1,375 tons and with 2,500 h. p. makes 16 knots. Last year the model tank developed the hull form for the gunboat Sacramento, a vessel of 300 tons more displacement, but of a speed of 16 knots upon a development of only 2,000 h. p. This saving of 500 h. p., calculated at $60 a horsepower, meant an economy in first cost of machinery of $30,000; but it also meant that the larger gunboat could be driven at a speed equal to her smaller sister ship.

With a tonnage of only 300, the Sacramento could carry a more powerful armament, sail further upon the same supply of fuel and more weatherly in storms; in brief, be a much better unit of the fleet. And all of this was made certain by the expenditure of a few hundred dollars for the wooden models of the most suitable length and shape.

Steamer George F. Brownell

Probably no two ships have ever been better known or more admired than the Owego and Chemung, of the Erie railroad lake fleet. The accompanying view of the latter, snapped in Cleveland harbor recently, as she was leaving port under her new name, George F. Brownell, after extensive alterations, shows clearly the graceful lines and shipshape appearance which have made them the admiration of sailormen. As the Chemung she established a record for speed which will probably never be equalled by a freighter on the lakes, since the conditions which justified high speed in a package freighter no longer exist. As the Brownell, however, she bids fair to achieve a no less notable reputation for economical operation as a result of the recent improvements. Figures so far available show a full reduction of over 40 per cent from her previous work at equal speeds, together with increased freight carrying capacity. In pursuance of the broad policy of the company in giving publicity to the work of its equipment more complete data will probably be forthcoming at the close of the season, but meanwhile there can be little doubt that the Erie fleet has established a standard of economical operation which can hardly be paralleled, as a fleet, by any ships afloat. THE MARINE REVIEW hopes to be able later to add to the data published for the past three years the comparative results of operation for 1913.



STEAMER GEORGE F. BROWNELL, FORMERLY THE CHEMUNG, OF THE ERIE RAILROAD LAKE LINE'S FLEET

The Brownell was given new boilers and draft system, together with engine modifications, new propeller, new houses throughout and complete new electric installation. A feature of the new houses is the use throughout of Byerlite for floors. The quarters have been made unusually comfortable. Brass and iron beds have been fitted throughout and five separate baths and toilets for the different divisions of the crew.

Probably not the least interesting item of the new equipment is a device now under observation for the first time which makes a timed graphic record of the telegraph signals given by the officer on the bridge and side by side with this record the record of the action of the engines both as to speed and direction.

The record is distinct and permanent and eliminates disputes as to signals and the action taken in the engine room. The charts, while in plain view at all times, are not accessible to anyone but the proper authority. The apparatus has been worked out by H. Penton, of Babcock & Penton, consulting engineers to the Erie Railroad Co., under whose direction the alterations in the ships of the fleet have been made. THE REVIEW has been promised an opportunity to illustrate and describe the apparatus in detail, with a reproduction of a section of the chart, later, but for the present the device is being kept under observation. In the chart THE REVIEW has seen, every shift of the telegraph is traced distinctly through spaces corresponding with the divisions on the telegraph dial and alongside is shown the response of the engines. No record is made of the reply from engine room since that is unimportant; the desirable information being as to what the bridge ordered and what was actually done. There is assuredly need of such a device aboard of every ship.

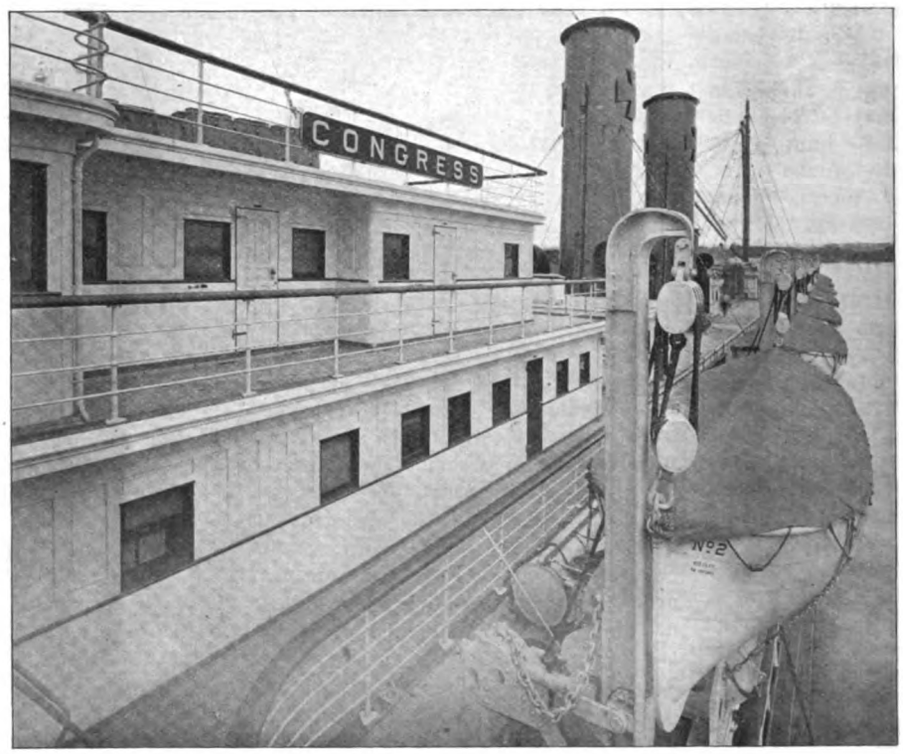
It is understood that the Hamburg-American Co. has asked for bids from Cramp's, Philadelphia, for the construction of three passenger and freight steamers to be 500 ft. long and capable of making 18 knots per hour. These vessels are intended for service through the Panama canal.

The Downey Shipyard, foot of Twenty-third street, Brooklyn, N. Y., launched the steamer Princess for the Bermuda Transportation Co. last month. The new steamer is 112 ft. long, 28 ft. beam and 7 ft. deep.

Trial Trip of Congress

She Exceeds Her Contract Requirements and is Now En Route to the Pacific

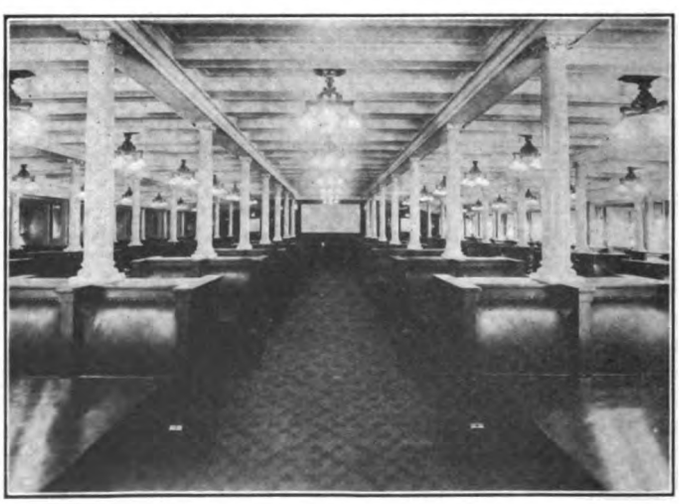
THE twin-screw passenger and freight steamer Congress, built by the New York Ship Building Co., from designs by G. W. Dickie, naval architect and marine engineer, San Francisco, which has been previously described in THE MARINE REVIEW, left the ship building company's dock, at Camden, at 10 o'clock, Saturday, July 17, for the official trial. The results of the trial were mailed to THE MARINE REVIEW from Trinidad by Mr. Dickie, who is accompanying the steamer to the Pacific coast. Mr. Dickie writes:



VIEW FROM NAVIGATING BRIDGE, SHOWING LINE OF BOATS

"As the vessel was under charter to load a general cargo for San Francisco, it was found impracticable to load her to a mean draught of 22 ft. 6 in., as required by the specifications, so the trial had to be made drawing 25 ft. aft and 16 ft. forward, or 9 ft. by the stern. The breakwater was reached late at night and the vessel anchored till daylight and then spent a few hours adjusting compasses. A progressive trial on the measured mile was then held, consisting of five double runs beginning at 10 knots and ending at 16.5 knots, from the results of which the speed, power and revolution curves were plotted. A run at full speed was then made out to sea for six hours and back again at a mean speed of 16⅝ knots.

"The Congress returned to the ship yard late on Sunday night and on July 29 she was accepted by the owners and proceeded to Port Richmond docks to take on a general cargo of 3,500 tons. She left Philadelphia drawing 27 ft. 2 in. mean or 26 ft. 4 in. in salt water, and began her long trip to the Pacific coast, leaving the light ship at 10 a. m., Sunday morning when the river pilot gave up charge to Capt. H. C. Thomas, who is taking the Congress out to San Francisco. As this is written on board and will be mailed from Trinidad, where we take on oil to replace what has been burned en route and this being the fourth day out there has been a chance to test the speed and power curves produced on the trials. The revolutions being fixed by the curve for 12½ knots, she has overrun that speed by from 6 to 9 knots a day, although the days have been six to seven minutes short of the 24 hours and the mean draught on trial was 20 ft. 6 in, while now it is 26 ft. 4 in., or 3,000 tons more displacement.



FIRST CLASS DINING ROOM, LOOKING AFT

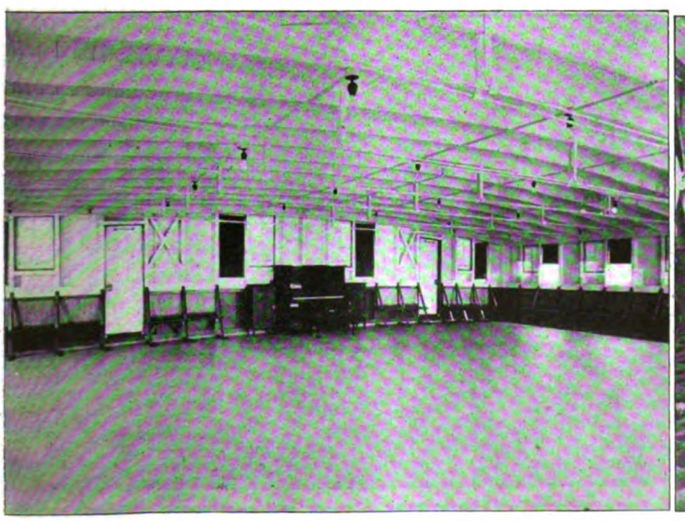
"As the interior arrangements of this vessel are entirely new to the coasting trade and as this large and finely appointed ship has been designed to meet the requirements of a rapidly growing business that bids fair to demand a type of coasting vessel that was not dreamed of 20 years ago, a few illustrations will serve to illustrate far better than words the type of vessel that is coming within the reach of those who travel by sea on the Pacific coast of the United States. The first thing that interests the passenger who never misses a

DATA FROM STANDARDIZATION TRIAL, JULY 20, 1913, OVER DELAWARE BREAK WATER COURSE

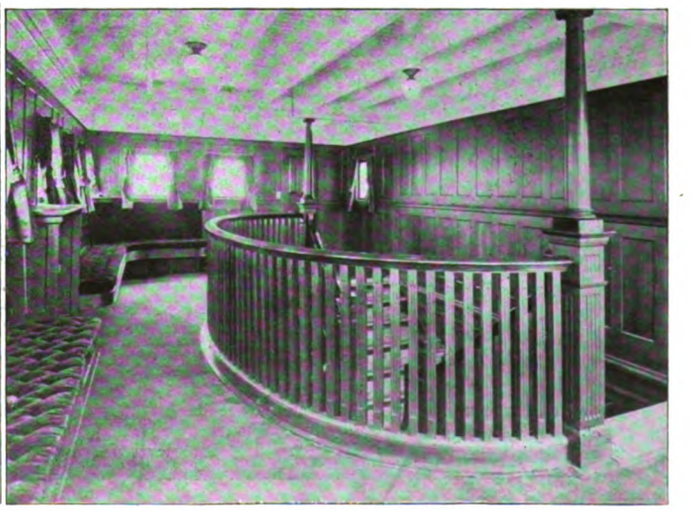
No. run.	Direction.	Counter reading.	Total revs.	Mean total revs.	Average R. P. M.	Mean R.P.M.	Elapsed time on course in minutes.	Mean speed.	I. H. P.	Mean I. H. P.	Pressures by gage. Mean steam.	I. P. rec.	L. P. rec. inches.	Vac. inches.
		P. Fin. 166,770												
		St. 166,465	305		52.3				590		165	3	11	27.8
1	N.			304.0			5.83							
		Fin. 173,260	303		52.0				607		169	0	11½	27.6
		S. St. 172,957												
						52.6		9.76		1,226				
		P. Fin. 168,666												
		St. 169,295	371		53.00				616		168	3	11	27.6
2	S.			371.0			7.00							
		Fin. 175,129	371		53.00				639		170	0	11½	27.6
		S. St. 174,758												
		P. Fin. 170.195												
		St. 169,804	291		68.16				1,749		169	17	0	27.7
3	N.			290.0			4.27							
		Fin. 176,681	289						1,369		170	13	0	27.75
		S. St. 176,392												
						68.2		12.95		3,210				
		P. Fin. 171,947												
		St. 171,573	374		68.6				1,716		168	16	0	27.8
4	S.			373½			5.458							
		Fin. 178,400	373		68.4				1,587		169	13	0	27.7
		S. St. 178,027												
		P. Fin. 173,682												
		St. 173,378	304		78.61				2,231		168	30	0	27.6
5	N.			304.0			3.867							
		Fin. 180,146	304		78.61				2,123		169	25	0	27.75
		S. St. 179,842												
						78.9		14.5		4,342				
		P. Fin. 175,456												
		St. 175,075	381		79.68				2,216		167	29	0	27.5
6	S.			379.0			4.783							
		Fin. 181.877	377		78.8				2,115		169	26	0	27.75
		S. St. 181,500												
		P. Fin. 177,135											Pounds.	
		St. 176,809	326		86.4				2,913		167	42	2	27.3
7	N.			322.5			3.773							
		Fin. 183,563	319		84.52				2,648		169	35	1½	27.75
		S. St. 183,244												
						85.5		15.25		5,627				
		P. Fin. 178,961												
		St. 178,581	380		86.61				2,967		167	41	2	27.1
8	S.			375.5			4.387							
		Fin. 185,315	371		84.59				2,727		168	36	1½	27.75
		S. St. 184,944												
		P. Fin. 180,804												
		St. 180,476	328		91.92				3,586		159	54	6½	27.6
9	N.			327.0			3.567							
		Fin. 187,168	326		91.36				3,553		162	34	6½	27.1
		S. St. 186,842												
						91.3		16.30		6,978				
		P. Fin. 182,773												
		St. 182 398	375		91.6				3,402		153	50	6	27.6
10	S.			372.5			4.092							
		Fin. 189,086	370		90.4				3,415		156	50	6	27.0
		S. St. 188,716												

Draught for'd, 15 ft. 5 in.; draught aft, 24 ft. 4 in.; mean, 19 ft. 10½ in.
S. W. displacement, 8,360 tons.
Sea calm; north wind blowing 4 miles per hour; weather cloudy; temperature on deck, 75 deg. Fahr.; barometer, 29.84 min.
Number of propellers, 2; number of blades, 3; diameter, 15 ft.; pitch as designed and set, 21 ft. 7½ in.; developed area, 3 blades, 77½ sq. ft.; projected area, 3 blades, 59.6 sq. ft.; pitch adjustable 12 in. either way.
Attached pumps:—Main air pumps, main feed pumps, bilge pumps.

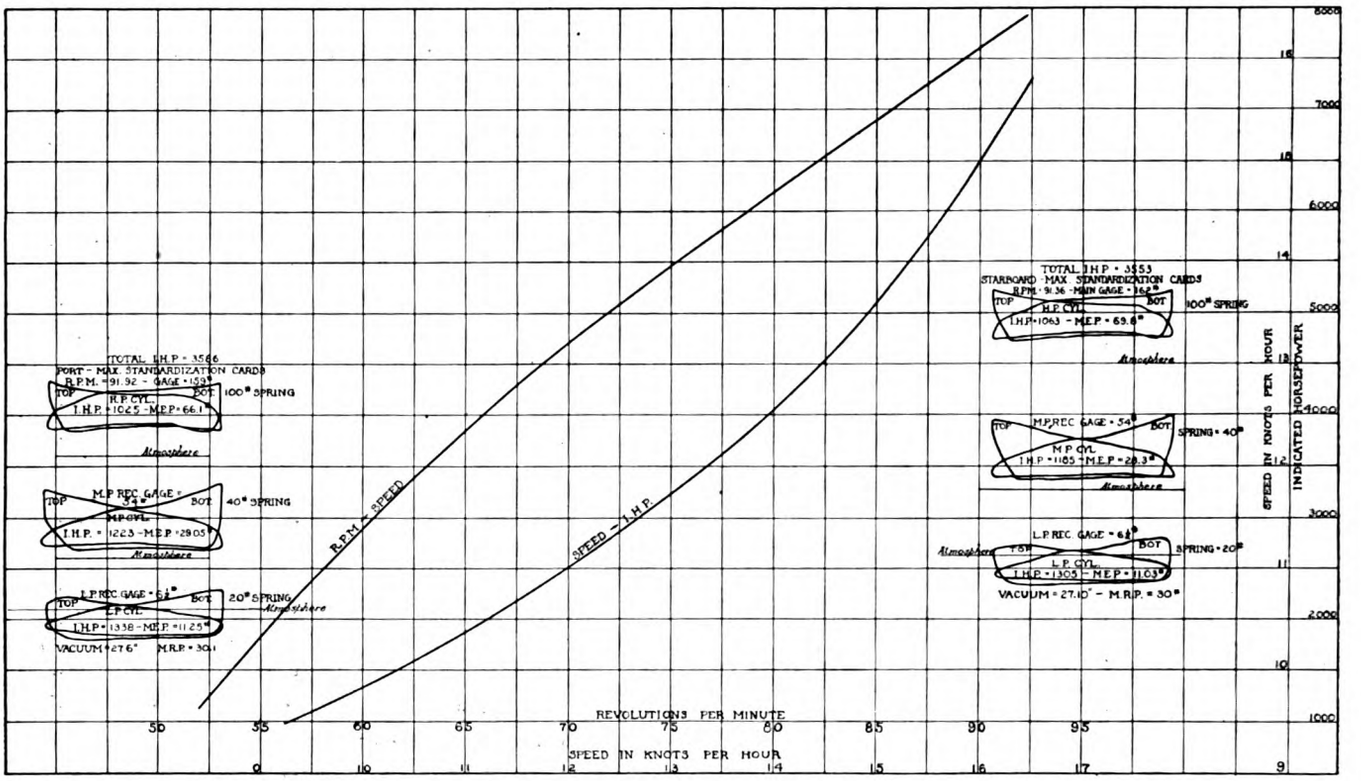
meal is the dining room. This room on the Congress is 75 ft. long and 53 ft. wide, and has 54 tables seating four persons each. The seats are arranged as a solid frame in polished mahogany, each surrounding a column encasing the steel deck pillars. The seats fold down and the seats and backs are upholstered in dark green leather. The floor in this room is of dreadnaught tiling. The tables at the sides are in alcoves which are formed by deep web frames. There are two 16-inch port holes in each alcove, making 42 in all. A window frame



BALL ROOM ON BOAT DECK AFT



DECK LOUNGE, HEAD OF GRAND STAIRWAY



RESULTS OF STANDARDIZATION TRIAL OF STEAMER CONGRESS

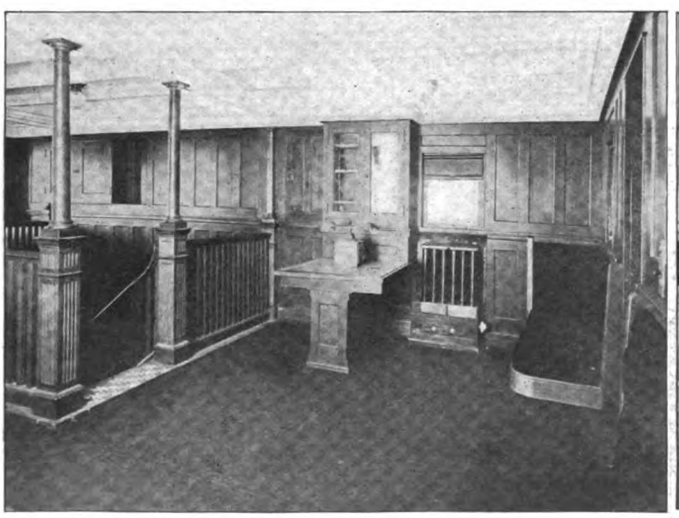
of prism glass covers the port holes, giving the appearance of large windows. These open for ventilation. Above the seats the room is finished in an ivory tint with parapan enamel, the roof being flat white. The photo gives a very good idea of its attractiveness.

"The first class lounge has been designed to meet the requirements of the passenger who seeks an elegant and airy place to rest. This room is on the bridge deck and is 48 ft. by 40 ft. in size. There are three large bay windows on each side, between which the electrical heaters are worked into fire places. The picture of this room gives a good idea of its style, the green carpet and green upholstery making a fine contrast with the mahogany finish.

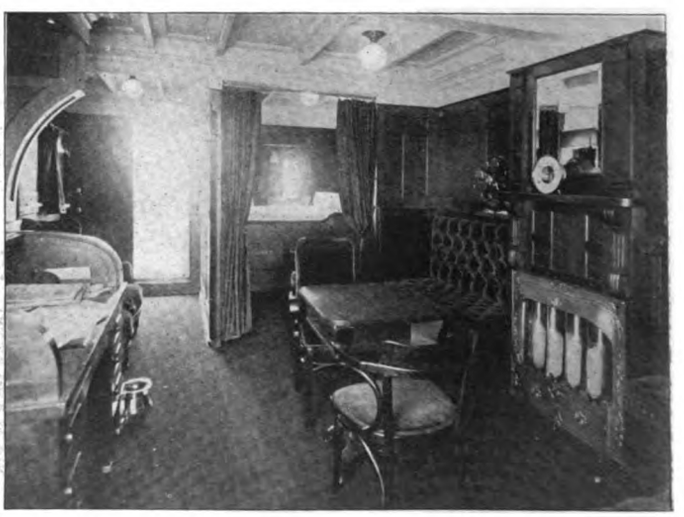
"The first class smoking room is on the boat deck forward and the second class smoking room on the bridge deck aft. Both these rooms are large, airy and comfortable and are both finished in quartered oak.

"The captain's quarters, immediately forward of the first class smoking room consists of a very handsome apartment en suite in mahogany. This room is directly under the bridge and the picture gives some idea of its size and attractiveness.

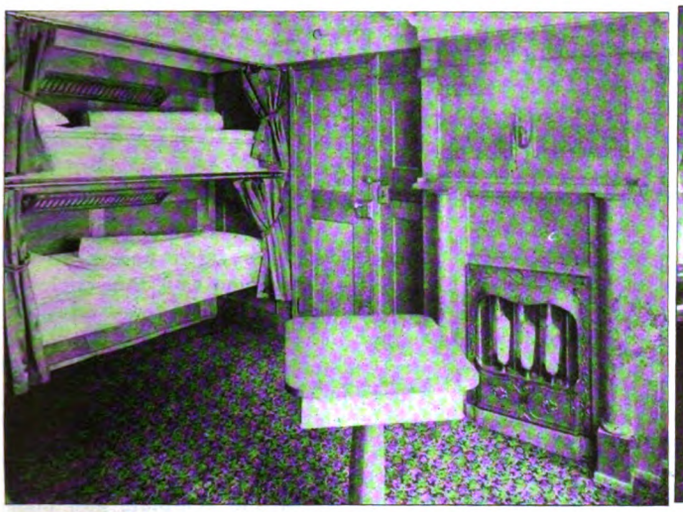
"The second-class passengers have been provided with comforts unknown to that class of travel on the Pacific coast. The second class lounge at the after end of the bridge deck is one of the most attractive public rooms on the ship. The second-class dining saloon on the upper deck is also a very handsome room. These rooms are in quartered oak. There are some very handsome staterooms on the Congress, and the picture of one suite in birdseye maple with blue draperies and upholstery is given as a sample. The deck lounges at the head of the stairs on the boat deck are a feature of this ship. The pic-



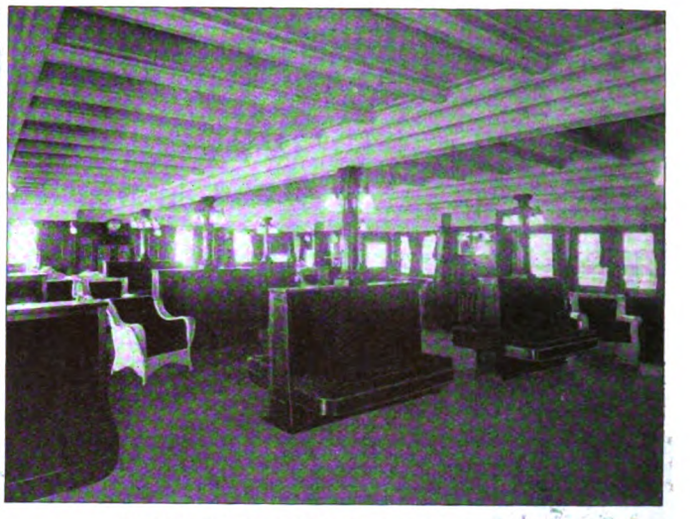
A CORNER IN THE SECOND CLASS LOUNGE



CAPTAIN'S ROOM ON THE BOAT DECK



SUITE ROOM, BIRD'S EYE MAPLE, SHELTER DECK



FIRST CLASS LOUNGE, LOOKING FORWARD

ture given of the forward deck lounge gives a good idea of the character of these rooms which are in quartered oak with upholstery in red plush.

"A very attractive feature of the Congress, especially on that part of her run south of Point Conception where the water is smooth and the evenings balmy, is the ball room on the after end of the boat deck. The roof of this room was designed so as to need no pillars so that the entire floor space is available for dancing.

"There is just one other feature of this interesting vessel which we wish to show, and that is the arrangement of boats and life rafts on the boat deck. There are 14 large life boats to carry 42 persons each and 14 life rafts with a capacity of 19 each stowed under them. All these are handled by the Norton patent sheathed screw davit and the picture shows the design of these davits and the arrangement of the boats.

"Whatever the success of this vessel may be, she illustrates the efforts being made to produce ships that are not only seaworthy and safe but are of such a character as to discount all the discomforts of coastwise travel on the ocean."

Navigates Vessel 15,000 Miles Unaided

The Liverpool ship Harold, 1,299 tons, with a cargo of wheat, arrived at Queenstown July 15 from Decru bay, Australia, in command of Capt. Charles Charleton, who performed the feat of navigating his vessel a distance of 15,000 miles to Queenstown without the aid of a single officer. The voyage occupied 108 days. Capt. Charles Charleton endeavored to get officers for his ship at Adelaide, Melbourne and Sidney, but without avail, and had no alternative but to set out on his voyage with a crew, none of whom knew anything of navigation. He went for stretches of six weeks without removing his clothes and slept on the poop of the ship on a cabin chair during most of the 108 days. Only two men of the crew were Britishers.

An Interesting Technicality

Realizing how slight a conception is entertained by the general reading public of the heavy draft made upon the effective horsepower of the big transatlantic liners to meet the resistance due to wind pressure alone, the *Scientific American* recently propounded the following problem:

"The largest transatlantic liner now under construction will present to a head wind a cross-sectional area above water, including smokestacks, masts, etc., of about 9,500 sq. ft. If the ship were steaming at a reduced speed of 15 knots against a head wind of 65 miles velocity, how much horsepower would be necessary to overcome the wind pressure alone?"

The various answers received showed results generally from 50 to 75 per cent less than the actual figures, this discrepancy being due to the fact that too low a unit wind pressure was used in making the calculations. Investigation of this problem by the *Scientific American* shows that in a transatlantic liner of, say 950 ft. long, by 100 ft. beam, driven by 60,000 h. p., no less than 20 per cent or about 12,000 h. p., would be consumed in overcoming headwind resistance in a 65-mile gale when steaming at 15 knots. In other words, there is found to be under the above named conditions, a total of 275,000 lbs. of atmospheric resistance due to the wind and the speed of the ship, and to overcome this at a speed of 15 knots would require from 12,000 to 13,000 effective horsepower, or about 20 per cent of the total horsepower of the ship.

New Dry Dock at Port Huron

The Reid Wrecking Co. is developing its plant at Port Huron into a modern shipyard. The company's new dry dock is capable of taking in a 400-ft. vessel. At present the Colonial is in dry dock and is being practically rebuilt. The steamer E. M. Peck, which was wrecked by the explosion of her starboard boiler at Racine, Wis., last June, is at the yard and will be converted into a canal vessel by taking 4 ft. out of her. A number of other repairs are under way, and with the building of two additional derrick barges, the company is assured of plenty of work until next spring. Mr. H. L. Tims, who has been with the American Ship Building Co. for the past 20 years and is well known along the lakes, is in charge of the plant.

A bill has been introduced in congress appropriating $100,000 for doubling the capacity of the government torpedo factory at Newport. This plant can turn out 100 torpedoes per annum, while the E. W. Bliss Co., of Brooklyn, has a capacity of 200, making a total supply of 300, which is regarded as inadequate.

A provisional agreement for the construction of a dry dock at South Boston, Mass., has been reached between the Hamburg-American Line and the International Mercantile Marine Co. and the directors of the Port of Boston.

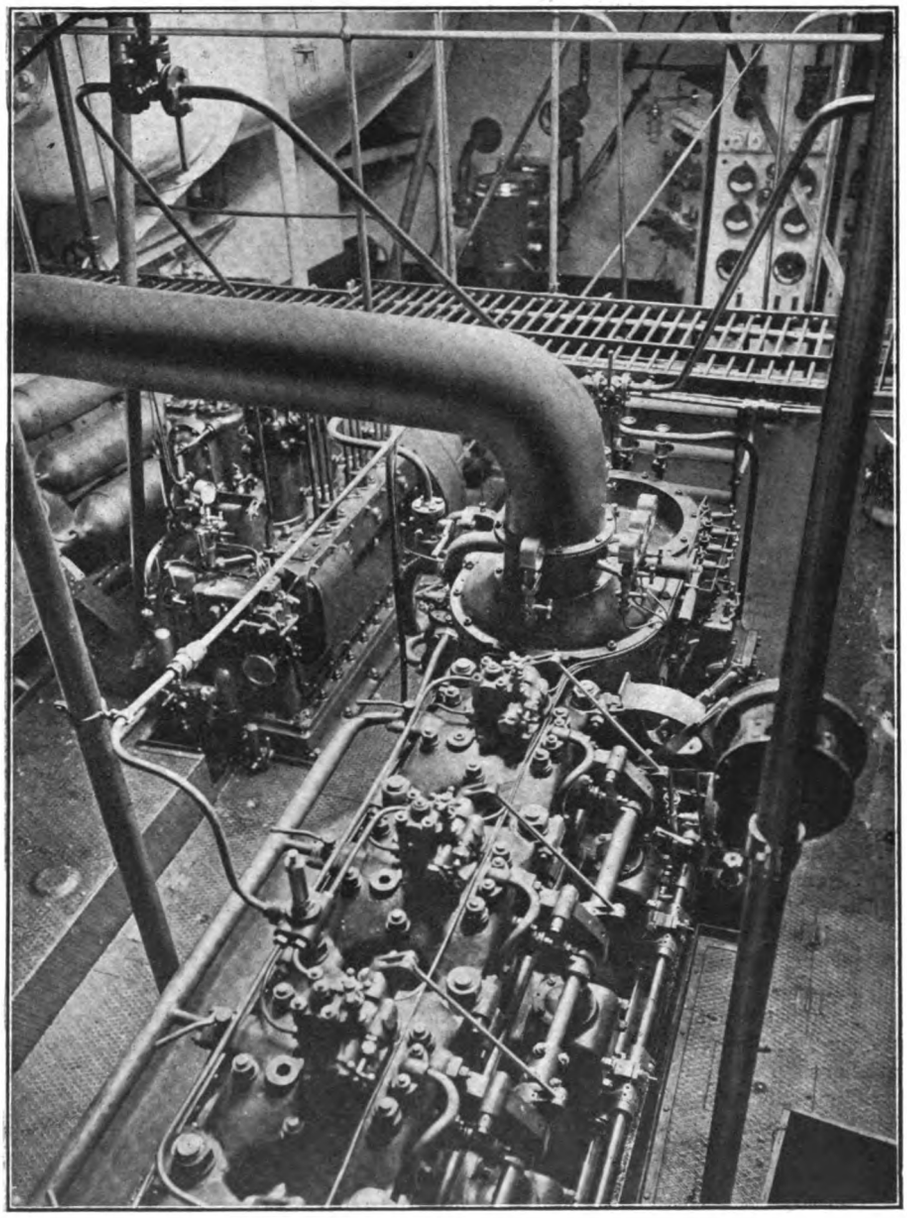
It is understood that the Hamburg-American Line is soliciting bids from American ship builders for three steamers for service through the Panama canal.

Elbe Motor Lightship

The Advantages of the Diesel Engine for This Type of Work Are Manifold as Operating Costs Are Low

THE Elbe estuary motor lightship, Burgermeister O'Swald (Elbe 1) has been built by Messrs. Nuscke & Co. from the designs of H. E. Johns, of Hamburg. With a motor-driven vessel not only are the running costs low, but the main engine is ready to start up in a few minutes in cases of emergency, without heavy stand-by charges, such as a steamship would require to keep a good head of steam night and day. With the motor ship the stand-by and running fuel charges are practically nil in the daytime, in ordinary weather, unless cruising, also sufficient fuel for a long period can be carried without encroaching on the space necessary for the comfort of the crew.

There are four Diesel engines, one of 220 h. p., two of 35 h. p., and one of 6 h. p., all of which were built by Sulzer Bros., of Winterthur. The main engine is of the two-stroke type, but the auxiliary motors work on the four-stroke principle. Dealing first with the main engine this is of the single-acting direct reversible class and develops its rated power at 280 r. p. m. Although of the enclosed type, it practically becomes an open engine on the removal of the large steel plates on the crank chamber. The cylinders, of which there are four, have their covers directly connected to the bed-plate by means of steel columns, thus the pressures are taken up directly by the bed-plate and main bearings, allowing the cylinders to be free to expand in the direction of their axis. These columns are connected by diagonal ties and the cylinder covers are bolted together, giving a rigid design. In connection with the scavenging and exhaust arrangements, Sulzer Bros. have sensibly adopted the port system leaving only the fuel and starting valves in the cylinder heads. The scavenging air enters the combustion chambers through ports in the cylinder walls, a certain number of the ports being in direct communication with an air chamber, the admission of atmospheric air into which is controlled by valves. The fuel valves are arranged in the centers of the cylinders, while the air-starting valves are located on the sides.

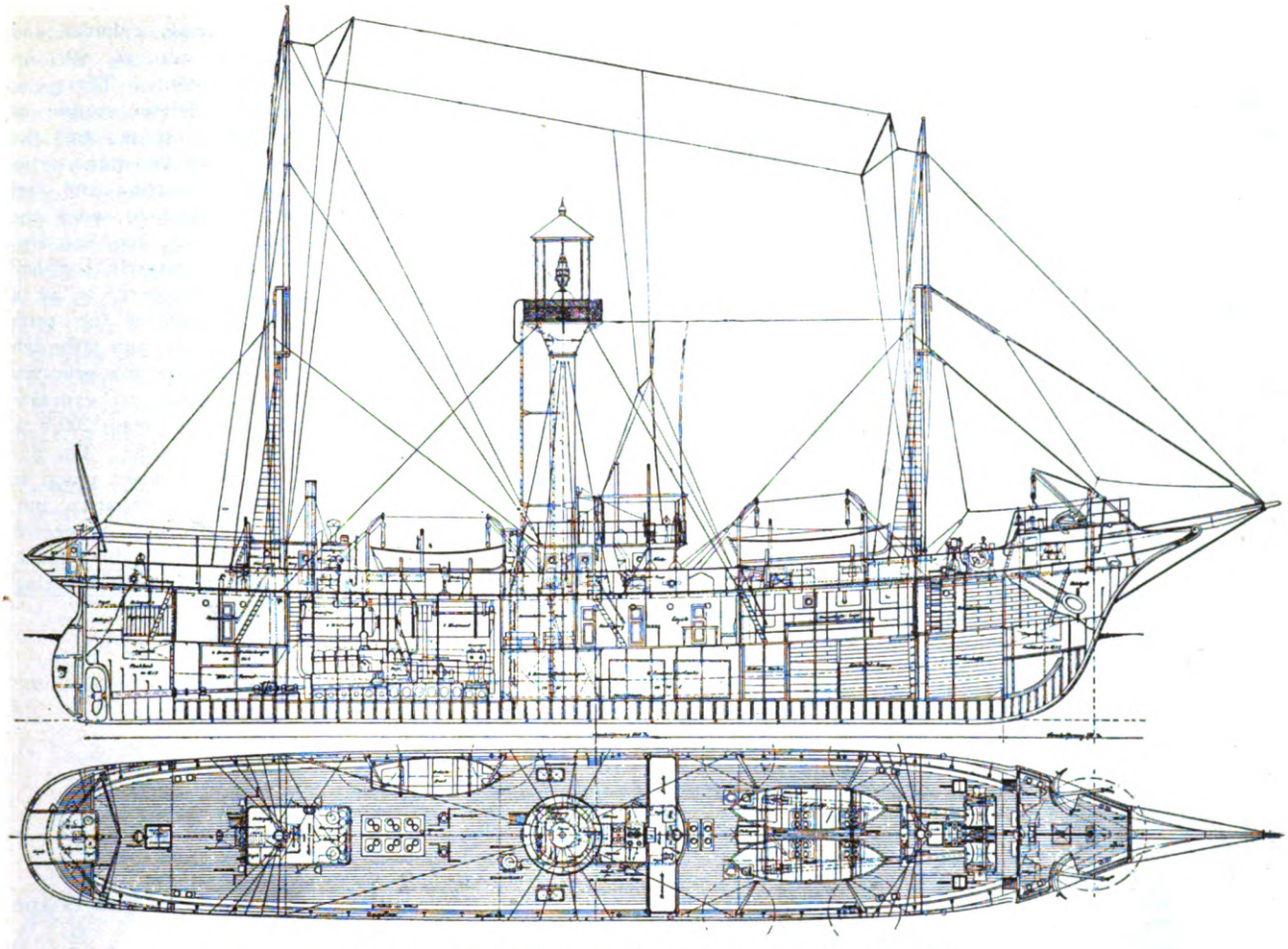


DIESEL OIL ENGINE AND DYNAMO SETS ON LIGHTSHIP ELBE I

Burgermeister O'Swald is equipped with the latest types of radio-telegraphy, submarine signalling apparatus, beacon-light and fog siren. In addition to Diesel-driven dynamos there are accumulators of large capacity kept charged. Her principal dimensions are as follows:

	Ft.
Length, overall	173
Length between P. P. S.	147½
Beam molded	25¼
Depth molded	17½
Draught	12½
Height of beacon above W. L.	52
Displacement, tons	720
Propelling motor, B. H. P.	220
Speed, knots	9

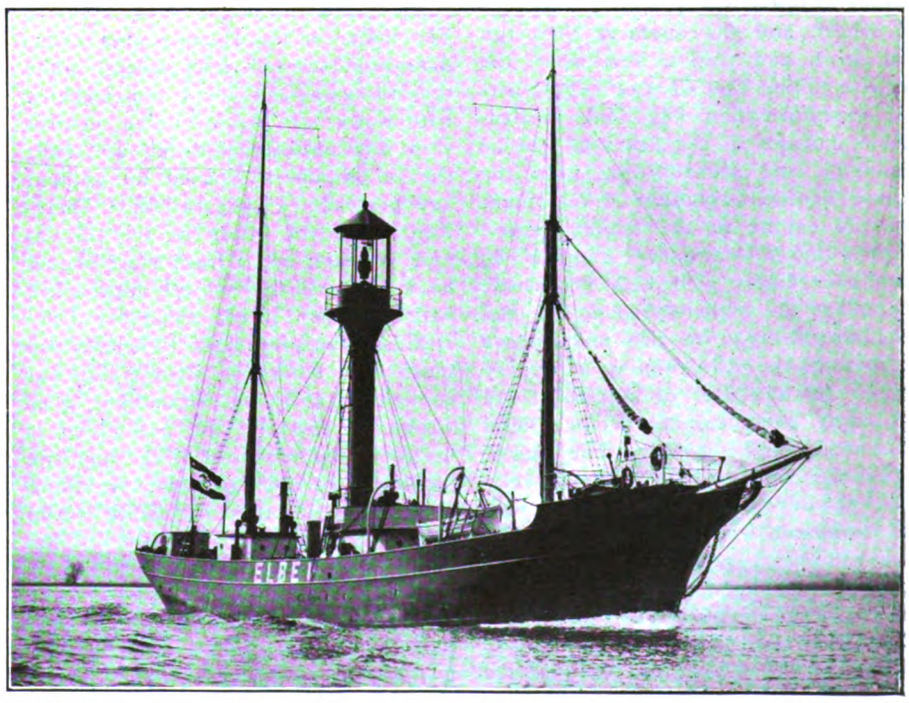
The scavenging pump consists of a double-acting piston-pump controlled by a rotating piston-valve in the casing and the crosshead of this pump is arranged as a first-stage air compressor, the second and third stages of which are driven by means of balance-levers from the crosshead of the scavenging pump on the port side of the engine. This patented arrangement has proved itself advantageous for high speeds, the various pressures being so evenly distributed that the inertia is nearly completely absorbed, thus giving a smooth drive. In the case of the scavenging pump, water



SECTION AND DECK PLAN OF MOTOR LIGHTSHIP ELBE I

cooling is not necessary, but the three compressor stages, however, are each separately water-jacketed and provided with 'tween coolers. The valve cams are mounted on the horizontal shaft which is driven from the crankshaft through a vertical shaft by helical gearing. The main fuel pumps are also driven from the shaft and are mounted on the compressor jackets at the starboard side of the forward end of the engine.

All cylinders are provided with forced lubrication supplied by the piston-type pump, which is driven by an eccentric on the shaft, the oil being supplied from a small reservoir through sight-feed controls. Forced lubrication is also provided for all bearings and gudgeon pins by a gear-pump placed on the forward end of the engines, the oil passing through a cooler and a filter before reaching the pump. Sea water is used throughout for cooling purposes, the cooling pumps being driven by the main engine. The gear pump mounted on the forward end of the engine is used for cooling the pistons, and the other, a plunger pump seen on the starboard side of the air pump, is for the cooling of the working and compressor cylinders. The latter pump is combined with the bilge pump and both are driven by balance levers from the air pump crosshead. For cooling the pistons the water is led through telescopic pipes, without stuffing boxes, the water entering the piston in the form of a free jet.



ELECTRICALLY-OPERATED GERMAN LIGHTSHIP ELBE I

The driving engines are of the three-cylinder, four-stroke, non-reversible, single-acting type, each giving 35 b. h. p. at 450 r. p. m. With each engine its two-stage compressor is driven direct from the crankshaft, while the engine frames are of box-form in two pieces, strengthened internally by columns, and have easily dismountable steel plate doors on each side. The starting, fuel injection and exhaust valves, are placed on the top of the cylinder heads. An adjustable governor is fitted, which regulates the lift of the suction valves of the fuel pump, thus varying the quantity of oil injected. Below the fuel pump may be seen a semi-rotary pump which supplies cooling water for the working cylinders and air compressors.

Both these auxiliary motors are direct coupled to continuous current Siemens-Schuckert dynamos. There is also a belt pulley mounted on the crankshaft from which is driven a countershaft suspended from the engine-room beams. From the other end of this countershaft two low-pressure compressors are driven; these compressors are placed forward of and on the same axis as the auxiliary motors and supply air for the fog siren at a pressure of 2½ atm. The direct-driven compressors of the auxiliary motors provide air at a pressure of 220 lbs. for the purpose of driving the windlass, a duplex general service donkey engine, and the ship's whistle. The various compressed air storage flasks, namely, for starting, fuel-injection, pumping and signalling purposes, are arranged in the port and starboard wings of the engine-room, above the auxiliary sets.

The auxiliary compressor is built V-shaped, the driving cylinder and compressor being set at 90 degrees to each other. There is one single-cylinder Diesel engine of 6 b. h. p. at 600 r. p. m., and the compressor is of the two-stage type. It supplies air for starting and fuel injection purposes, and to work the general service donkey, and has also a small bilge pump directly coupled. Its principal use, however, is as a stand-by in the event of the total failure of the air supply, and although constructed to start on low-pressure air, it is large enough to generate sufficient air to start the main 200-h. p. engine in a very short time. The duplex general service donkey pump is of 15 gals. per minute capacity and, as already mentioned, is connected so as to pump the oil and ballast tanks and bilges, and deck washing and for fire service.

Heavy Oil Engines*

Description of the Nurnberg Two-Cycle Engine as Built by the New London Ship & Engine Co.

By Lieut. Comdr. Louis Shane

BEFORE beginning the description it should be pointed out that the heavy-oil engine is not the simple machine that many writers and exploiters of the engine have made it out to be. The general impression prevails that all that is necessary to do to operate this engine is to turn a wheel, and the operator then can sit down and read a newspaper, the engine taking care of itself. This sort of misinformation has done incalculable damage to the heavy-oil engine industry, and probably has been the cause of the very slow development of the engine in the United States. Lower-power stationary engines do run exceedingly well with very little care, but the higher-speed engine and the marine type require much more care than the slow-running stationary type. As a matter of fact there are as many complications in the Diesel engine as in the steam engine, and if one takes into consideration the relative newness of the heavy-oil engine, as compared with the steam engine, the complications are much more numerous. For instance, in the 450-H. P. engine to be described there are about 2,500 different kinds of parts.

One of the first things an engineer must do when taking up the heavy-oil engine is to drop his steam-engine prejudices. In so many ways the method of operating is so different from the method of operating a steam engine, that to a steam engineer it would appear that nothing but disaster could follow the use of such methods. For instance, the steam-engine cylinders are jacketed with steam, while the oil-engine cylinders are jacketed with water; the steam engine requires slow and uniform warming up, while the oil engine is started up without any preliminary preparations. Therefore, when the study of the oil engine is taken up, a fresh start should be made, and the subject approached with an open mind, unhampered by steam-engine prejudices. There is too much of a tendency, when trying out something new and something goes wrong, to say that the new thing is no good, and too little of the opposite tendency, of making the new thing good by correcting its faults. And this is exactly the problem of the heavy-oil engine—to correct minor faults.

It should be remembered that even with the great strides made in the last five years the heavy-oil engine is still an infant, and much remains to be done before it can approach the degree of development of the steam engine. Much has already been done, and the results shown are remarkable, but a great deal more will be done, for there are many problems yet to be solved. One of the interesting side questions that have arisen is the one of castings. The heavy oil engine is the despair of iron foundry men. So far, in the construction of these engines for submarines, 90 per cent of the cylinders cast have been rejected at some time during the process of manufacture. This trouble has been so great that the manufacturers have put an engineer on the work of solving this question. It had to be approached from a scientific standpoint. The questions of gates, risers, chills, cores, etc., were thoroughly studied, and many experiments made. It is believed that the development has reached the point where 50 per cent of the cylinders will pass all the tests and trials This merely shows how the development of the oil engine is affecting other branches of engineering, and indicates the way the development is going, for, when the material question is solved, most of the heavy-oil engine troubles will be solved. Material troubles enter into other parts of the engine, as, for instance, valves and packing. These are not so serious

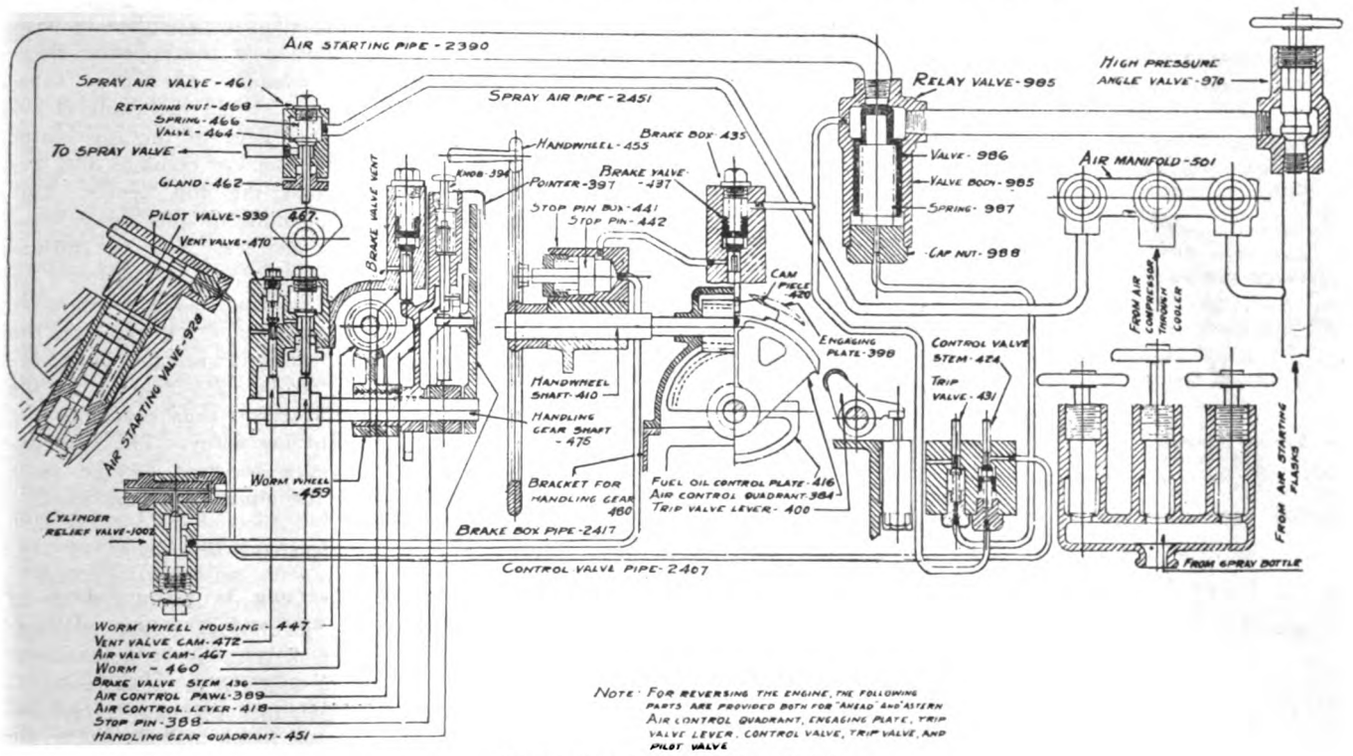
*From the Journal of the Society of Naval Engineers.

but must be reckoned with.

Another question is the matter of cooling. In the smaller engines this is not serious, as the ordinary jacketing is sufficient for cylinders, and pistons are not cooled. With larger-powered engines, however, this becomes more complicated. The piston must be cooled as well as the cylinder, and the cylinder jackets must be very carefully designed, so that at no part is there a thickness so great that the cooling water will not carry off the heat fast enough to keep the cylinder walls sufficiently cool to prevent damage to the cylinder. This at times is no easy matter. The spray valves, scavenging valves, and such others as are needed, are all in the cylinder head and must necessarily be close together. The positions of the cams and cam shaft have a great bearing on the positions of these valves. So sometimes the problem of keeping the valves far enough apart to admit of the cooling water circulating freely around the valve openings is quite difficult. At present the limit of diameter of cylinders is determined largely by the rate of flow of heat through the walls. As long as the thickness of the walls is not so great as to prevent the heat passing off quickly enough to the water, and keeping the heated surface sufficiently cool to prevent erosion or damage, the present methods of design will hold. When, however, large diameters are necessary, the question of cooling will be a serious one, and other methods of cooling will have to be adopted.

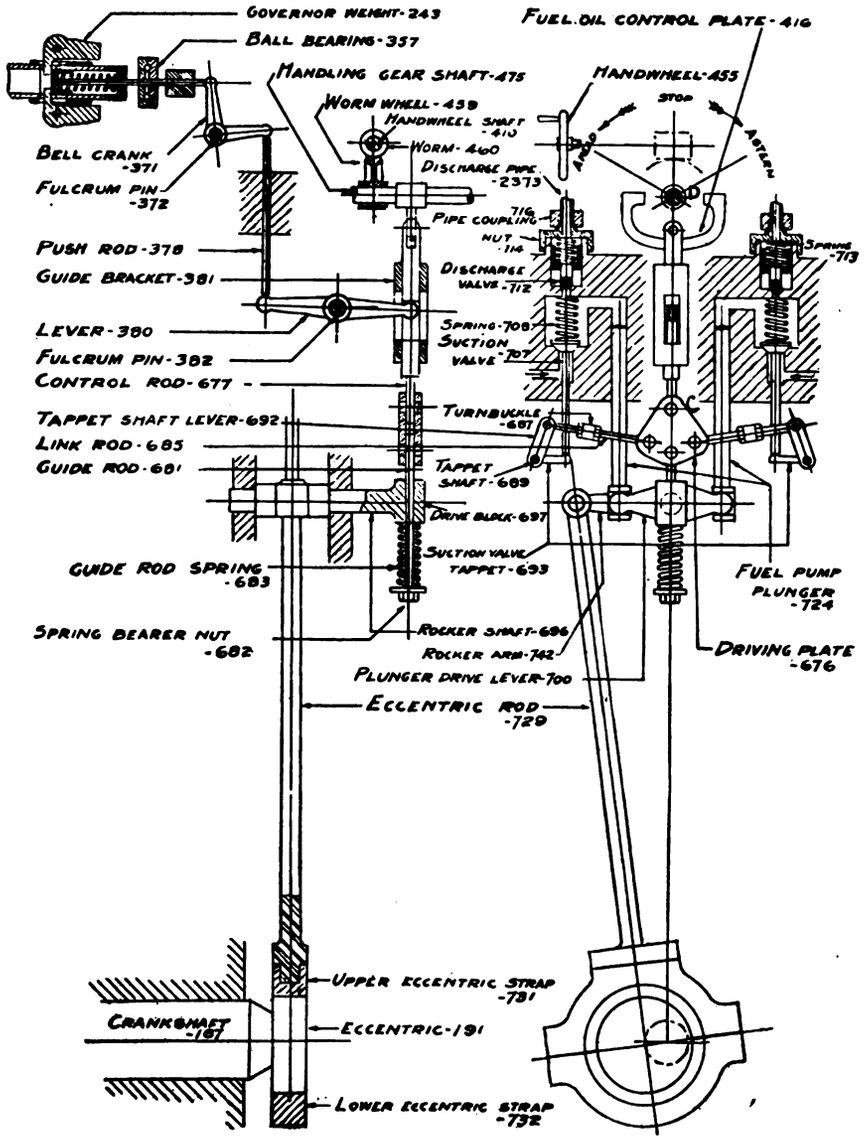
These engines are the two-cycle engines of the Nurnberg type, with scavenger cylinder under the working cylinder. The piston (Sketches I and III) is in steps, the upper or smaller diameter being the working piston and the lower or larger diameter being the scavenger piston. The area of the annular part of the scavenger piston is about 1.4 times the area of the working piston, and maintains about 9 pounds pressure in the scavenger receiver. The space around the scavenger cylinder in the housing is used as a scavenger receiver. This merely acts as a reservoir, and no scavenger cylinder scavenges its own working cylinder. The scavenging air is led through a pipe to the scavenger valve, and when that opens the air enters the cylinder and blows out the exhaust gases, the exhaust ports being uncovered during this period. As the scavenging is done with air and not with the fuel mixture as with the ordinary two-cycle gas engine, complete scavenging can be obtained and thus higher efficiencies. Besides, the scavenging valve can be put where the scavenging can best be effected. Also, while the actual volume of air is considerably less than the volume of the cylinder, the fact that this air is under 9 lbs. pressure when the exhaust ports are closed gives this engine very close to the volumetric efficiency of the four-cycle engine, which has not a greater pressure at the same part of the stroke.

The engine has six cylinders, with one two-stage air compressor at the forward end. Each cylinder has its own scavenger cylinder (Sketch III), but each scavenger cylinder merely acts as a low-pressure compressor and discharges the air into a receiver (F, Sketch III), which supplies the scavenging pipes (J, Sketch III). There is a separate fuel-feed pump for each cylinder, which takes its motion from an eccentric on the forward end of the crankshaft (Sketch IV). The pumps and valves are together at the forward end of the engine, and discharge through small copper pipes into the spray valves. The fuel control is ingenious. The plungers of the fuel-feed pump-724 (Sketch IV), run at a constant stroke and discharge through spring loaded valves-712, into the pipe line-2373, to the spray valve. The suction valve-707, also acts as a regurgitating valve in connection with the plunger which, if open, allows the oil to return to the suction side of the pump. If the regurgitating or suction valve is open during the entire revolution of the engine no fuel will go into the engine, and the amount of fuel at each revolution is governed by the length of time the regurgitating or suction valve is open. This is accomplished with a driving plate-676, which governs the stroke of the suction valve and in this manner regulates the opening. Fuel-oil control



DETAIL OF HANDLING GEAR

plate-416 (Sketch IV) governs the position of the driving plate-676. As the fuel-oil control plate revolves around D as a center, the center C, about which driving plate-676 oscillates, moves up or down. As the eccentric rod-729 moves up and down, the driving plate oscillates back and forth, making suction-valve tappets-693 move up and down. At the same time plunger-drive lever-700 oscillates and drives plungers-724 up and down a



FUEL FEED PUMP AND GOVERNING MECHANISM

constant stroke. As the center C of driving plate-676 moves down the arc through which tappet shaft lever-692 oscillates will move toward the center, suction valve tappet-693 will oscillate lower down, and the suction valve will be closed during a longer portion of the stroke. As C moves up, he tappet-693 will oscillate higher up and keep down the suction valve open during a greater portion of the stroke. While suction valve-707 is open, the fuel will go back to the suction line. When it is closed the oil must go on through the discharge valve-712. Consequently, the amount of fuel discharged is governed by the length of time the suction valve is open, and this in turn is governed by the position of center C of the driving plate. The governing is done with the same device. That is, a ball governor-243 on the cam shaft is attached through levers-371-372-378-381 and 380 to fuel-regulating device, and automatically regulates the opening of the regurgitating valve in the same manner as the fuel-control plate-416, and thus governs the engine.

The circulating water is pumped through reciprocating pumps on the forward end of the engine geared down from the main shaft to 4/9 revolutions of the main engine. There is also a fuel pump for pumping fuel into the suction of the fuel-feed pumps above described. This is run from the same crosshead from which are run the circulating pumps. All the handling gear pumps, etc., are on the forward end of the engine. The lubricating-oil pump is also run from this crosshead. The cylinder lubricating oil is forced under pressure by a special lubricating manifold run from the vertical cam shaft by spiral gearing on the after end of the engine.

The cam shaft is run from the main shaft by means of spiral gearing and vertical shaft. On the cam shaft are the spray cams, the scavenger cams, and the air-starting cams. The reversing is accomplished with compressed air. The vertical shaft has a special coupling with a 30-degree blank. On reversing, the upper section remains stationary till the lower section has turned through 30 degrees when all cams are then in position for motion in the opposite direction. For example, the spray valve begins to open when the crank is 2½ degrees in advance of the top center and closes when the crank is 32½ degrees beyond the top center. This gives an opening of the spray valve through 35 degrees. Now by shifting the cam shaft back 30 degrees by means of this clutch, the spray valve will begin to open 2½ degrees on the opposite side and remain open beyond the stroke 32½ degrees in the opposite direction, thus reversing the functions of the spray. The scavenging cams are reversed by the same action of the clutch and cam shaft.

Reversing the Engine

The reversing is accomplished by separate cams and reversing valve, or air-starting valve, which is the same for either direction. The following is an extract from Patent No. 1,005,507, a perusal of which will facilitate the understanding of the description of the handling gear.

Figure 1 is a diagram showing in section part of the engine cylinder with the starting valve, the distributing valves, the operating members therefor, and the compressed air vessel; Fig. 2 is a similar diagram to Fig. 1, showing a modification. a is the starting valve, the cone of which is held in closed position by a spring b. The upper part of the valve cone is formed as a piston c. The conduit d from the compressed air vessel A opens laterally into the casing of the starting valve. Above the piston c the starting valve is connected by the conduit e with the two distributing valves f and g, which communicate respectively through the conduits h and i with the operating members k and l. A conduit x connected with

the conduit d runs to the operating members.

The engine is started in the following manner: In Fig. 1 the compressed air vessel A is opened and either the operating member k or l actuated by the operating lever m. The air then flows through the operating member k or l into the conduit h or i, places the slide valve f or g in operative position with respect to the cam n or o and then flows through the conduit e into the casing of the starting valve a exerting a pressure on the piston c. The starting valve is opened and air can now flow through the conduit d into the motor cylinder M. According as the slide valve f or g is operated, the machine will run forward or reversed.

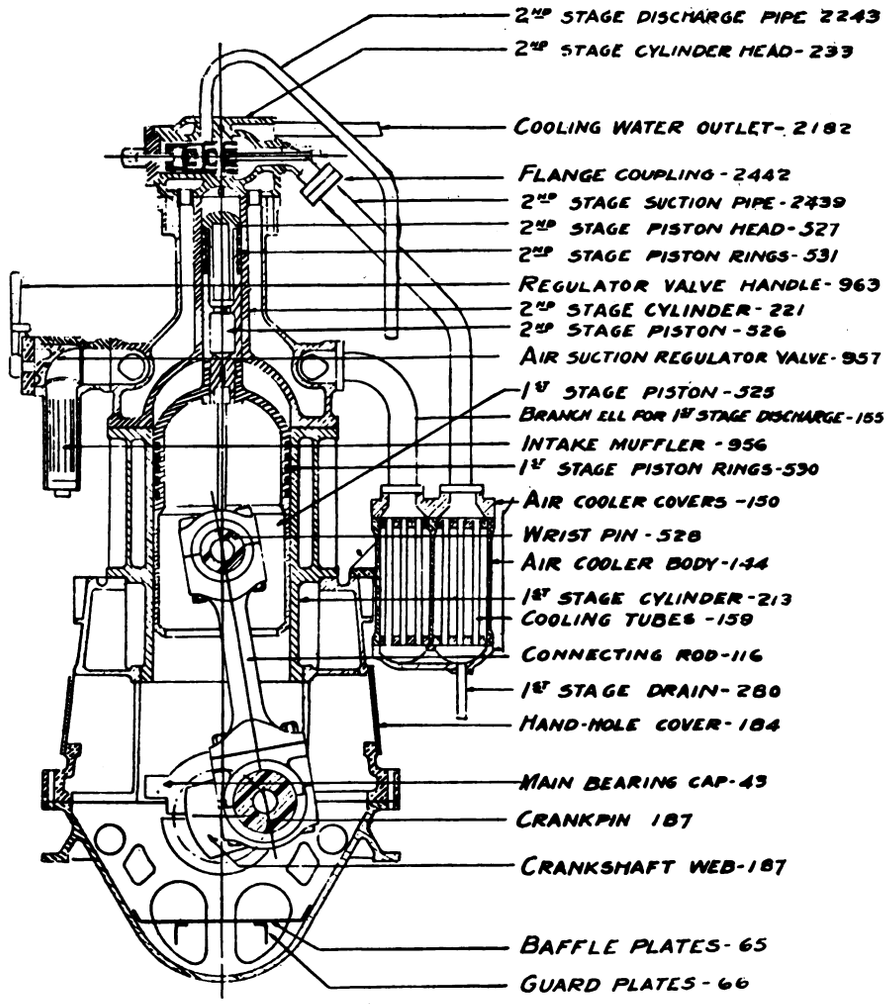
Detail of Engine

According to Fig. 2 an auxiliary member p is arranged in the conduit d between the compressed air vessel on the one hand and the slide valves and the starting valve on the other hand. This auxiliary member consists of a cut-off valve formed as a cone valve, and is intended to prevent loss of compressed air and thus to insure certain and speedy operation of the several parts. The cut-off valve p consists mainly of the chamber valve q held in closed position by a spring b. A conduit r leads from the casing of the cut-off valve p to the operating members k and l. These operating members k and l do not, however, as in Fig. 1, consist of a slide valve, but each operating member includes a valve s and t. In this case the engine is started as follows: The compressed air vessel A is opened, whereby the chambers u and v of the valve q and the valves s and t of the operating members k and l are placed under pressure: the compressed air has to pass a restricted passage w connecting the chambers u and v. The operating lever m is set to one side or the other according as the engine is run forward or reversed, thereby displacing the member k or l, with the result that the conduit x is connected with the conduit h or i. By continuing to act upon the lever m the valve s or t is opened and the chamber b becomes momentarily exhausted because sufficient air cannot pass through the restricted passage w. Consequently the valve q opens and compressed air can flow through the main conduit d to the starting valve and through the conduits x and h or i to the slide valve f or g. The slide valve f or g is pressed onto its cam n or o and compressed air then enters through the conduit e, ing pressure against the piston c. the casing of the starting valve exert- The starting valve opens and will remain open so long as the slide valve f or g permits of communication between i or h and e. When the slide valve is pressed back by its cam n or o, the conduit e will be in communication with the atmosphere, the starting valve will be relieved and closed under the pressure of its spring b. If the engine is running forward and it is to be reversed, the starting valve is actuated in the manner indicated by the reversing block. The lever m is arranged in such a manner that in addition to the reversing gear it actuates the fuel pumps and enables the supply of fuel to be cut off during reversing. The starting air first acts in opposition to the movement of the engine, acting as a brake and then causes the engine to rotate in the opposite direction.

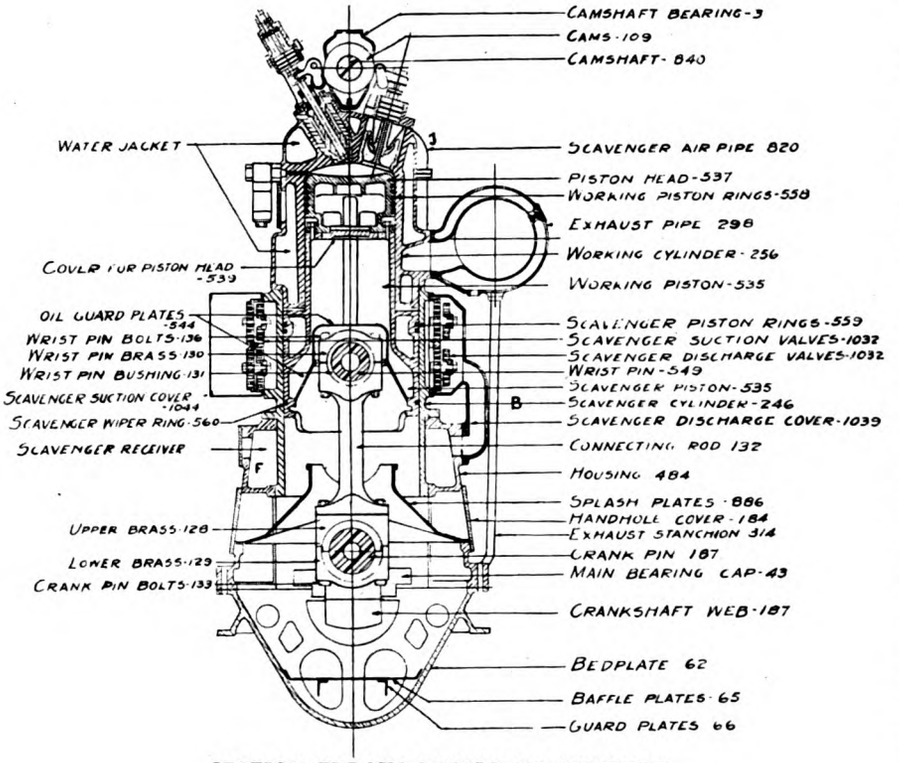
The operation of handling gear is as follows. (See Sketch V.):

The first operation is to open all valves in manifold-501, and high-pressure angle valve-970. In the manifold the left valve allows air to go to the spray air relay valve-461. The middle valve opens to the compressors and the right-hand valve to the air-starting flasks. Air then backs up from the air-starting flasks to the top of the compressor piston. High-pressure angle-valve-970 allows air to go to the relay valve-985, to the pipe on the opposite side, air going to the top of brake valve-437 and under control valve-424. At the same time air enters through a small hole shown in the valve-986, through pipe in cap nut-988 to trip valve-431. All this has been accomplished by opening the three valves in air manifold-501 and high-pressure angle valve-970. The handling gear is now in position for operating the engine, and these valves are always open when the engine is operating or ready to operate.

In order to start the engine in either direction, turn the hand wheel-455 in the required direction. This wheel turns a worm-460 which operates worm wheel-459, to the axis of which the various cams, etc., are fixed. As this axis revolves, cam-420 lifts brake valve-437, the plunger underneath which first closes the brake-valve vent.



SECTION THROUGH AIR COMPRESSOR



SECTION THROUGH WORKING CYLINDER

Air then enters stop-pin box-441 and drives stop pin-442 out, preventing the handle from making more than one revolution till the air is released after pressures are relieved in cylinders. At the same time air enters brake-box pipe-2417 and on top of piston in cylinder-relief valve-1002, forcing open the valve and allowing what pressure there is in the cylinder to release. As hand wheel is turned cam-420 goes by the brake valve, closing the valve and venting the line. This releases the air pressure in stop pin box and brake-box pipe, allowing spring to force stop pin-422 back and seating the relief valve-1002. As the hand wheel is turned a projection on air-control pawl-389 catches under an engaging plate-398, which allows the bottom of pawl-389 to engage air-control sector-384, forcing it to turn on the same axis. The forward edge of this sector pushes the bell-crank lever-400 over, pushing down and opening first, trip valve-431 and then, control valve-424. When this is done air is released through trip-valve vent shown from underneath relay valve-985 (the opening in valve being much smaller than vent in trip valve). The difference in pressure opens the relay valve allowing air to go to air-starting valve-928 through air-starting pipe-2390. This brings starting air to each cylinder. As soon as control valve-424 is open air is admitted to control-valve pipe-2407 and behind the plunger or pilot valve-939. (There are two pilot valves and air-starting cams on each cylinder, one for ahead and the other for astern; only one is shown in the figure.) One or two of the air-starting cams are in such position that the air back of the pilot valve forces it forward far enough so that the inner end uncovers the port to the top of piston of the air-starting valve-928, forcing the valve open and allowing air into the cylinder, thus starting the engine, the other cylinders taking up the motion in rotation. Just as the air-starting gear has the engine going at the requisite speed, spray-air-relay valve cam-467 opens spray-relay valve-461, first closing vent valve-470, which allows spray air to go to the main spray valve on the cylinder, starting the engine on fuel. Just as this is accomplished the projection on air-control pawl-389 disengages from engaging plate-398, the spring forcing it up, releases sector-384, which flies back closing trip valve-431 and control valve-424. This again closes relay valve-985, shutting air off air-starting valves-928. As control valve-424 is closed small vents are opened and release pressure in control-valve pipe-

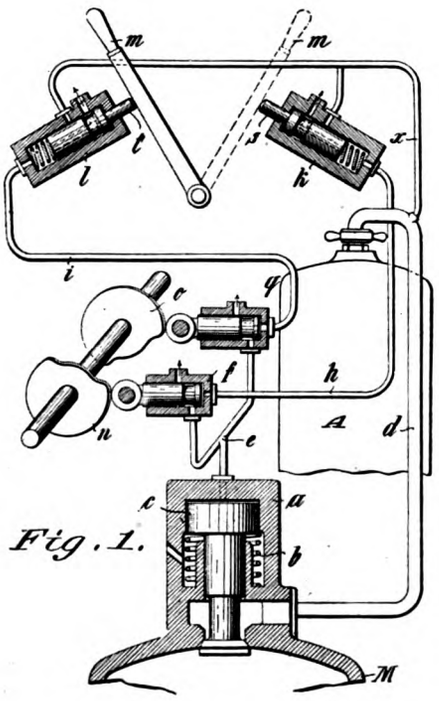


Fig. 1.

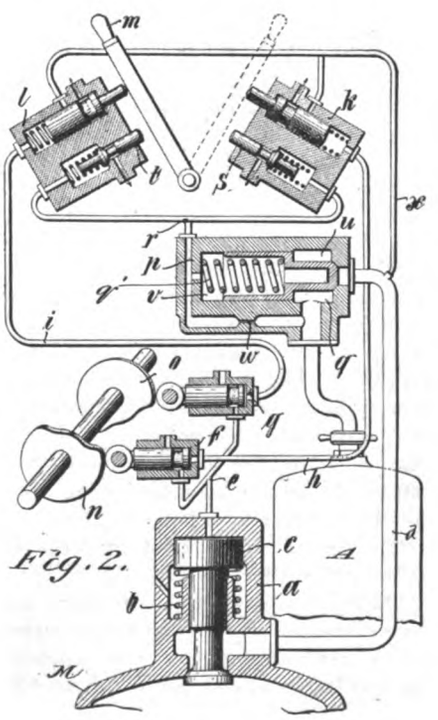
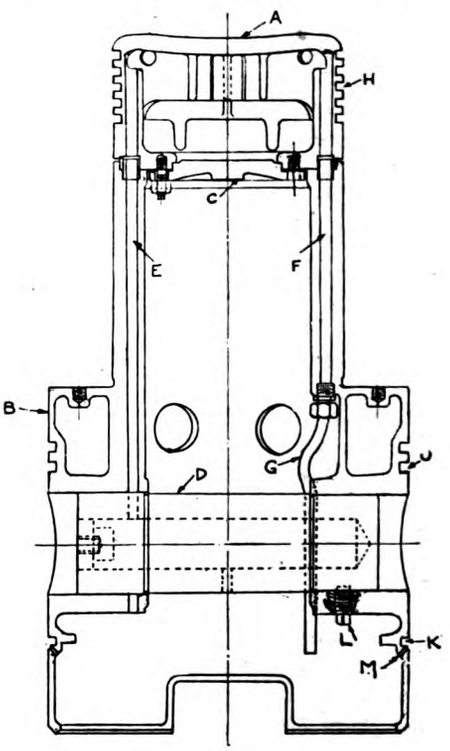


Fig. 2.



2407, the pilot valve-939 being forced back from the cams. Just before the spray-air-relay valve-461 is opened fuel-oil control quadrant-416 is in position to allow fuel to be forced into the fuel pipes. The engine is now running under fuel, all the air-starting mechanism being disengaged. The speed varies with the distance through which the hand wheel is turned. The farther over the wheel is turned the greater amount of fuel is pumped into the spray valve at each revolution, the fuel-oil control plate-416 regulating this by regulating the position of the stroke of the suction or regurgitating valve of the fuel-feed pumps.

Working and Scavenger Cylinders

The working and scavenger cylinders are of cast iron, but for lightness the housing and bedplates are of bronze. Sketch III shows that the scavenging and working cylinders are separate castings in this type of engine. The working cylinder-256 is water jacketed, as is the exhaust pipe-298. The air-starting, spray and scavenging valves are not jacketed. The piston head (A, Sketch I) is oil cooled. The oil from the wrist pin D enters a hole E inside the piston, flows through the head, and out through another hole F on the opposite side of the piston, through a pipe G that is led clear of the wrist pin and into the crankpit. The piston is made in two sections. Lower section B includes the body of the working piston and the whole of the scavenging piston, while the upper section A is the piston head. This construction was adopted because of the trouble experienced with the core plugs in the top of the piston where the single-casting type had been used. After a certain length of time these core plugs would come out, in spite of all precautions taken with their installation, and cause considerable damage. With the two-section type the holding-down bolts are in recesses in the side, and never come in contact with the hot gases, and, as the top has no holes of any description, there is now no trouble with core plugs loosening. The upper section is large enough to take all of the piston rings. The wrist pin D is secured in the scavenging piston and thus is not exposed to the heat of the working cylinder. This is a great advantage in that it is not difficult to keep wrist-pin bearings cool.

Several of these engines have been given very severe tests, one of them a full-power test of 28 hours. The lubricating system seems to be very well designed, for, while 14 of these engines have been tested, there has not been a single case of hot bearings. A copy of the record of a six-hour test of one of these engines follows. It will be seen that the powers are very uniform. In testing, the engine drives a generator and the power generated is absorbed by large pipe resistances which are cooled by water circulating through them. While the test is under way the volt and ammeter pointers scarcely move, showing how well the fuel feed is regulated.

REPORT OF TEST.—FIRST THREE HOURS.

Engine, 75-6. Type, H. S. No. 103. Date, 12-17-12.

Time	2:30	2:45	3:00	3:15	3:30	3:45	4:00	4:15	4:30	4:45	5:00	5:15	5:30
Revolutions	450	450	450	450	450	450	450	450	450	450	450	450	450
Volts	210	210	210	210	210	210	210	210	210	210	210	210	210
Amperes	1,475	1,475	1,475	1.470	1,470	1,470	1,470	1,470	1,470	1.470	1,470	1,470	1,470
H. P.	443	443	443	441	441	441	441	441	441	441	441	441	441

Consumption—Total for run: First three hours:—
Oil, 13.5 gallons; rate, gallons per minute..... 26
Water, 14,760 gallons; rate, gallons per minute..... 82
Fuel, 105 gallons; rate, pounds per horsepower hour..... 0.57

Adjustments:—A. C. control, wide open. Control lever, 2⅜ turns. Size of spray nozzle, 0.187.
Fuel oil, lot No. 2, western oil.
Lubricating oil, trade name, Autoline, No. 2.
Condition of exhaust:—White smoke at end of pipe. Brown vapor at 3-inch try valve.

Pressure, pounds:													
Air pump, first stage	105	105	105	105	105	105	105	105	105	105	105	105	105
Spray air	875	900	900	900	900	900	900	900	900	900	900	900	900
Scavenger receiver	9¼	10	10	10	10	9	9	9	9	9	9	9	9
Oil	44	45	45	45	42	44	42	42	43	42	42	44	43
Water	8	7½	7½	7¼	8	7½	7	7	7	7	7	7	7
Auxiliary fuel	5	5	5	5	5	5	5	5	5	5	5	5	5
Temperatures, deg. Fahr.: Exhaust, not taken:—													
Water inlet	46	46	46	46	46	46	46	46	46	46	46	46	46
Water outlet	90	90	90	90	90	90	90	90	90	90	90	90	90
Oil inlet	65	85	90	96	100	100	100	100	100	100	100	100	100
Oil outlet	130	142	150	158	162	167	164	164	162	160	160	160	160
Scavenger receiver	147	152	180	200	212	206	204	200	198	198	198	198	198
Atmosphere	68	68	68	68	68	68	68	68	68	68	68	68	68
Crankpit	130	140	160	170	174	176	166	164	164	162	162	162	162

Remarks.—At the end of one hour the relief valves on the scavenger receiver were set at 9 pounds.

REPORT OF TEST.—SECOND THREE HOURS.

Engine, 75-6. Type, H. S. No. 103. Date, 12-17-12.

Time	5:45	6:00	6:15	6:30	6:45	7:00	7:15	7:30	7:45	8:00	8:15	8:30	
Revolutions	450	450	450	450	450	450	450	450	450	450	450	450	
Volts	210	210	210	210	210	210	210	210	210	210	210	210	
Amperes	1,470	1,475	1,470	1,470	1,470	1,470	1,470	1,470	1,470	1,470	1,470	1,470	
Horsepower	441	443	441	441	441	441	441	441	441	441	441	441	

Consumption—Total for run.—Second three hours:—
Oil, 13.5 gallons; rate, gallons per minute..... 26
Water, 14,760 gallons; rate, gallons per minute..... 82
Fuel, 100.5 gallons; rate, pounds per horsepower hour..... 0.55

Adjustments:—A. C. control, wide open. Control lever, 2¼ turns. Size of spray nozzle, 0.187.
Fuel oil, lot No. 2, western oil.
Lubricating oil, trade name, Autoline, No. 2.
Condition of exhaust:—Same as first three hours.

Pressures, pounds:—													
Air compressor, first stage	105	105	105	105	105	105	105	105	105	105	105	105	
Spray air	900	900	900	900	900	900	900	900	900	900	900	900	
Scavenger receiver	9	9	9	9	9	9	9	9	9	9	9	9	
Oil	45	43	45	43	43	43	43	43	43	43	43	43	
Water	7	7	7	7	7	7	7	7	7	7	7	7	
Auxiliary fuel	5	5	5	5	5	5	5	5	5	5	5	5	
Temperatures, deg. Fahr.: Exhaust, not taken:—													
Water inlet	46	46	46	46	46	46	46	46	46	46	46	46	
Water outlet	90	90	90	90	90	90	90	90	90	90	90	90	
Oil inlet	100	100	100	100	100	100	100	100	100	100	100	100	
Oil outlet	160	160	160	158	158	158	158	158	158	158	158	158	
Scavenger receiver	198	198	198	198	198	198	198	198	198	196	196	196	
Atmosphere	68	68	68	68	68	68	68	68	68	68	68	68	
Crankpit	160	160	160	158	158	158	160	160	158	158	158	158	

Remarks:—During the last three hours not a single adjustment was made on engine or switchboard.

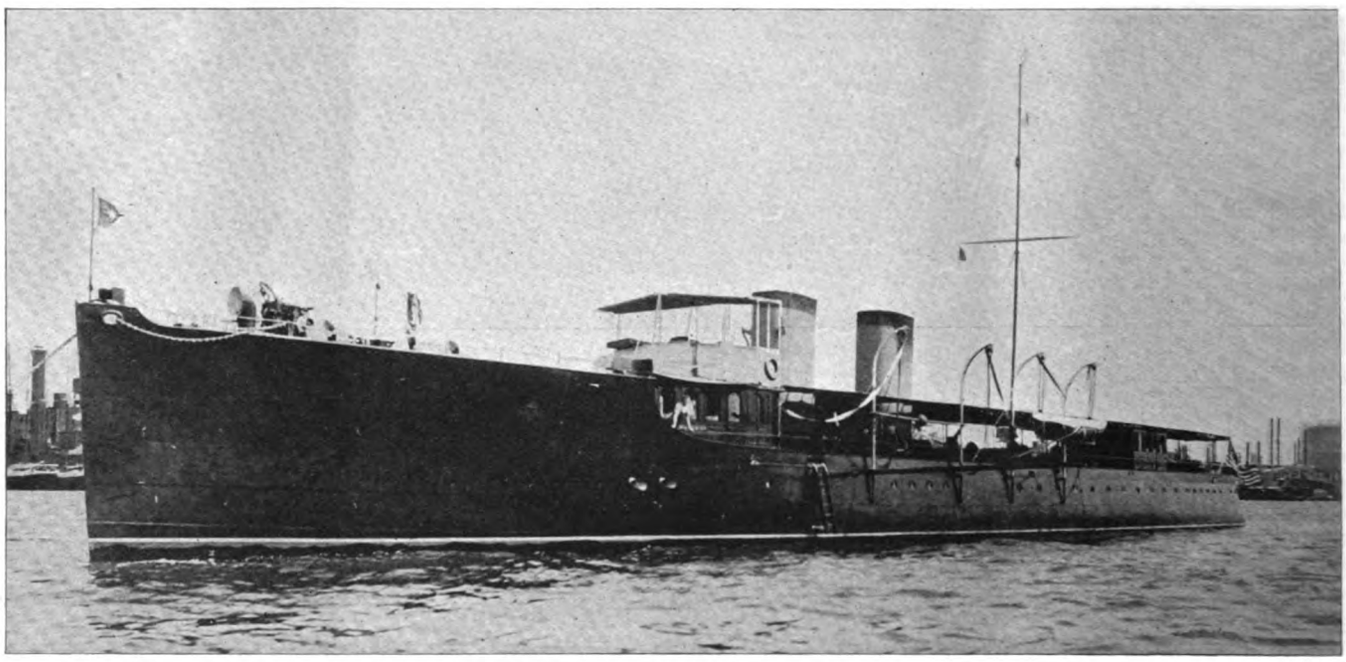
Captain Alfred Brown, of the Flushing life saving station corps, swam from the Battery to Sandy Hook, a distance of 22 miles, last month. He was in the water 13½ hours. Many have attempted this feat, but this is the first time it has ever been accomplished.

The Joseph Dixon Crucible Co., Jersey City, N. J., has received a letter from Fred Heckler, superintendent of the Lake Shore Electric Railway Co., Fremont, O., to the effect that Dixon's graphite cup grease No. 2 is the best lubricant for trolley wheels.

Steam Yacht Winchester

The Third of Her Name—Makes a Speed of 32 Knots on Her Trials

THE new turbine express steam yacht Winchester, owned by Peter Rouss, New York, which was launched at the yard of Yarrow & Co., Scotstown, May 15, was completed a few weeks ago, and on her trial made her contract speed of 32 knots with 165 lbs. of steam. The new Winchester was designed by Messrs. Cox & Stevens, of New York, and the contract was awarded to Messrs. Yarrow & Co., by reason of the very satisfactory results obtained in the previous Winchester, the construction of which was also entrusted to the same builders. The new Winchester is an entire departure from the conventional type of express steam yacht. She is 205 ft. in length, her beam is 18 ft. 6 in., and the contract speed 32 knots. The propelling machinery consists of Parsons turbines supplied with steam by water tube boilers of the Yarrow type, oil fired. In appearance the hull is most unusual, and although the novelty of the design may to some appear so unusual as to lead to adverse criticism, anyone having actual knowledge of the results desired and a sense of the fitness of things nautical will at once appreciate the merits and the actual beauty of the design.



TWIN-SCREW STEAM YACHT WINCHESTER

The vessel is flush deck throughout, having practically a straight shear, and for a distance of about one-fourth of the length from the stem, the freeboard is raised to form an upper forecastle, as is done in the modern torpedo boat destroyers in order to secure sea-going qualities. The deck dining room which is unusually large and capable of seating at least twenty-four persons with comfort, is placed directly aft of the raised fore-castle and the forecastle deck is carried over the dining room on a continuous level by means of this construction. The vessel by reason of her high free board forward will be able to be driven comfortably at high speeds even in rough weather, without taking water on deck and without danger of breaking the windows in the dining room, which is completely sheltered by the forward portion of the vessel. The dining room finished entirely in selected panelled mahogany, and contains in addition to an extension dining table a large side board at after end and two corner cupboards at the forward end. The pantry is directly forward of the dining room and communicates by dumb waiter with the galley, which is below, and extends the full width of the vessel. Forward of the pantry is a mess room, access to which is had by a door on the port side, and from the mess room a passage runs forward into the raised forecastle. This raised forecastle is divided off into four state rooms providing accommodation for the captain, engineer, steward, assistant engineer and mate. These officers will thus have excellent accommodations and their quarters are so placed as to make it easy for them to get to and from their positions when the vessel is under way.

From the mess room on the port side, a stairway leads below to the lower forecastle landing in a passage. At the after end of this passage is a galley containing a large coal range and ice box of ample capacity which can be filled from on deck, a sink dresser, and the usual racks for stowage of glass, china, and cooking utensils. On the starboard side of the pantry next to the galley is a stateroom having berths for the cook and waiter and forward of this is an officer's wash room equipped with lavatory, toilet and shower bath. On the port side of the passage is a store room of large size next to the galley and forward of this is crew's toilet. At the forward end of the passage the lower forecastle commences which has accommodation for eight men in pipe berths. By this arrangement, the

entire crew is comfortably housed at one end of the vessel.

The machinery space, on account of the great power required, namely, approximately 5,500 h. p., occupies a very considerable portion of the vessel's length amidships. The turbines of which there are two, together with all auxiliary machinery, are in the after end of the machinery space, the boilers occupying the forward portion. Special attention has been given by the designers to securing not only the most satisfactory installation of propelling machinery possible, but also of the various auxiliaries which are in each instance of the most approved type. The electric light plant is of unusual power and the storage battery capacity is ample in size and of the most modern type. The oil fuel for firing the boilers is carried in thwartship tanks sub-divided with swash bulkheads and arranged in the most convenient and approved manner, both as regards filling, cleaning and safety. The stacks, of which there are two, are elliptical in shape and of unusual size in fore and aft direction, giving the appearance of power to the vessel to which she is entitled.

A Cozy Corner

At the after end of the dining room a very attractive feature has been arranged, namely, a shelter seat, opened only at the rear, where it would be possible to sit in the fresh air even under the most stormy conditions with absolute comfort. On the after deck is a deck house built entirely of selected mahogany, which will be used as a deck saloon and also as a means of access to the after quarters. The stairs to these quarters are at the after end of the deck house and lead in the main saloon, which is 14 ft. in length and full width of the vessel. This saloon has on the port side a transom-sofa, and a writing desk, and on the starboard side a transom-sofa and two buffets. This room will be finished in Colonial style with mahogany furniture. The sides of the vessel and the upper portions of the bulkheads as well as deck overhead to be finished in white. From the saloon, entrance is had at the forward end into the owner's stateroom, which is 10 ft. in length and the full width of the vessel. This room will be remarkably attractive as by reason of its large size, it is possible to arrange furniture to advantage. It contains a double brass bed, two large hanging ward robes, a seat and dressing table on the port side and on the starboard side, a full length sofa and a bureau. This stateroom, as well as the other staterooms for the guests, will be finished in Colonial style with mahogany furniture and door enamel paint overhead, also at the vessel's side above the mahogany wainscoting. The hardware being of special design and all the knobs cut glass. The owner's bathroom is directly forward of his stateroom, and extends the full width of the vessel thus forming a means of reducing the effect of the noise of the machinery. This room has a tiled floor and is finished throughout in white enamel. The toilet is on the port side partitioned off from the rest of the bath room, which is sufficiently large to be used as a dressing room and contains in addition to linen lockers, a full length porcelain bath tub, porcelain wash basin and a bureau. This bath room is equipped with hot and cold running water and cold salt water.

At the after end of the saloon a passage on the center line runs directly aft of a large double stateroom extending the full width of the vessel. This room has at the after end a bureau, with plate glass mirror, and on each side a built-in berth with drawers for stowage underneath and two large hanging wardrobes. On the port side of the passage next to the saloon is a single stateroom having a built-in berth with drawers underneath and bureau with plate glass mirror, a small stateroom being on the starboard side of the passage. On the port side between the single stateroom and the after stateroom is a bathroom for the guests with tiled floor and all the usual fittings, and on the starboard side opposite this space a large linen room with ample stowage capacity is very conveniently arranged.

A consideration of the above description shows that, although Mr. Rouss is getting a vessel of high speed, he is also getting something that is usually not to be found in vessels of this type, namely, most comfortable quarters for himself and guests.

Reduction of Weights

In the construction of the hull as it was of vital importance to reduce the weights as much as possible without sacrificing strength and staunchness, particular care was given to the design and materials used. Special high tension steel was selected for the hull plating and the frames are special section bars having the maximum strength with the minimum weight. An inspection of the construction drawings of the hull shows that a rigid structure has been secured capable of standing hard driving in a sea way without danger of straining any portion of the vessel.

The awning is run on one level from the stern to the after end of the dining room, being supported by substantial stanchions so that they can be carried in all weather. There is one signal mast at the after end of the machinery space, and the navigating bridge is placed forward on the top of the dining saloon, having a very carefully worked out arrangement of wind shields so that the helmsman may be in comparative comfort even when driving into a hard sea.

The lines have been developed with the idea of securing the maximum speed possible on the dimensions and power given and at the same time bearing in mind the fact that a good seaboat is required and a vessel that will be as dry as possible. An inspection of the lines shows that the displacement is distributed well throughout the length of the vessel thus producing a very easy run, and the sections show considerable dead rise throughout, the top sides having a slight tumble home from amidships aft, while forward there is a very considerable flare.

Developing Express Yacht

Mr. Rouss is to be congratulated upon his persistence in the matter of developing the fast express steam yacht. This is the third vessel of this type built for him, each one of which has borne the same name. The first Winchester, now called the Adroit, was sold by Messrs. Cox & Stevens to Alfred Vanderbilt, who still owns her, and immediately after her sale, Mr. Rouss entrusted this firm of architects to place for him the order for the second Winchester, which was the first oil-burning turbine express steam yacht ever built. Last fall, Mr. Rouss, having had such a satisfactory experience with the second Winchester and being desirous of owning a larger and faster vessel of the same type, commissioned Messrs. Cox & Stevens to sell the second Winchester for him which they did, and to design and have built for him a new vessel, the result of which is the present Winchester.

The Winchester is painted black, and with her striking and clean lines unquestionably looks what she is meant to be, namely, an express vessel of maximum speed, capable of maintaining this speed under adverse conditions with the greatest possible safety and comfort to those on board.

Steamship Matsonia

The Latest Addition to the Fleet of the Matson Navigation Co. is a Splendid Specimen

THE Matsonia, a steel, single-screw steamship, to be completed in October by the Newport News Shipbuilding & Dry Dock Co., of Newport News, Va., is the latest addition to the Matson Navigation Co.'s fleet, and is intended to maintain a regular service between San Francisco and Honolulu, Hawaii.

She will be equipped for carrying a large amount of cargo and also is provided with modern and up-to-date quarters for the accommodation of 246 first-class passengers and 78 steerage passengers as well as a crew of 121 officers and men.

The general arrangement of the vessel is shown by the elevation and deck plans. The leading particulars of the vessel are:

	Ft.	In.
Length, overall	500	
Length, between perpendiculars	484	
Breadth, molded	58	
Depth, molded to shelter deck	44	9
Sea speed, loaded to 24 ft. draught, knots	16	
Displacement at 24 in. draught, tons	13,500	

The ship has been constructed in full accordance with Lloyds Register of Shipping, Class 100-A1.

The machinery is located aft, as on the other vessels of this line. The cargo will be carried forward of the machinery space below the upper deck and in the portion of the upper 'tween decks forward of the dining saloon. Provision is made for carrying a large supply of fuel oil, the lower part of the forward hold being arranged for fuel oil storage, as well as the double bottoms, which are made deeper than usual, and the fore peak. Amidships in the hold is a tank for carrying over 200,000 gallons of molasses, with pumping plant adjacent. This tank is also arranged for carrying fuel oil on emergency. A large space on the lower 'tween decks is fitted up for carrying refrigerated cargo, and the upper 'tween decks forward is arranged especially for the carriage of bananas. The total space available for cargo is about 450,000 cu. ft. exclusive of the molasses tank.

The upper deck amidships as well as two tiers of houses above shelter deck are devoted to the accommodation of passengers. Deck officers' quarters and pilot house are located in teak house above the passenger quarters.

On shelter deck aft are located the purser's office and Marconi rooms. The seamen's quarters are located in the forecastle, while aft on upper and shelter decks are located quarters for the engineers, stewards' department, etc.

On the shelter deck is provided a social hall forward with deck houses aft, containing staterooms opening on to a wide and spacious promenade extending the entire length of the vessel.

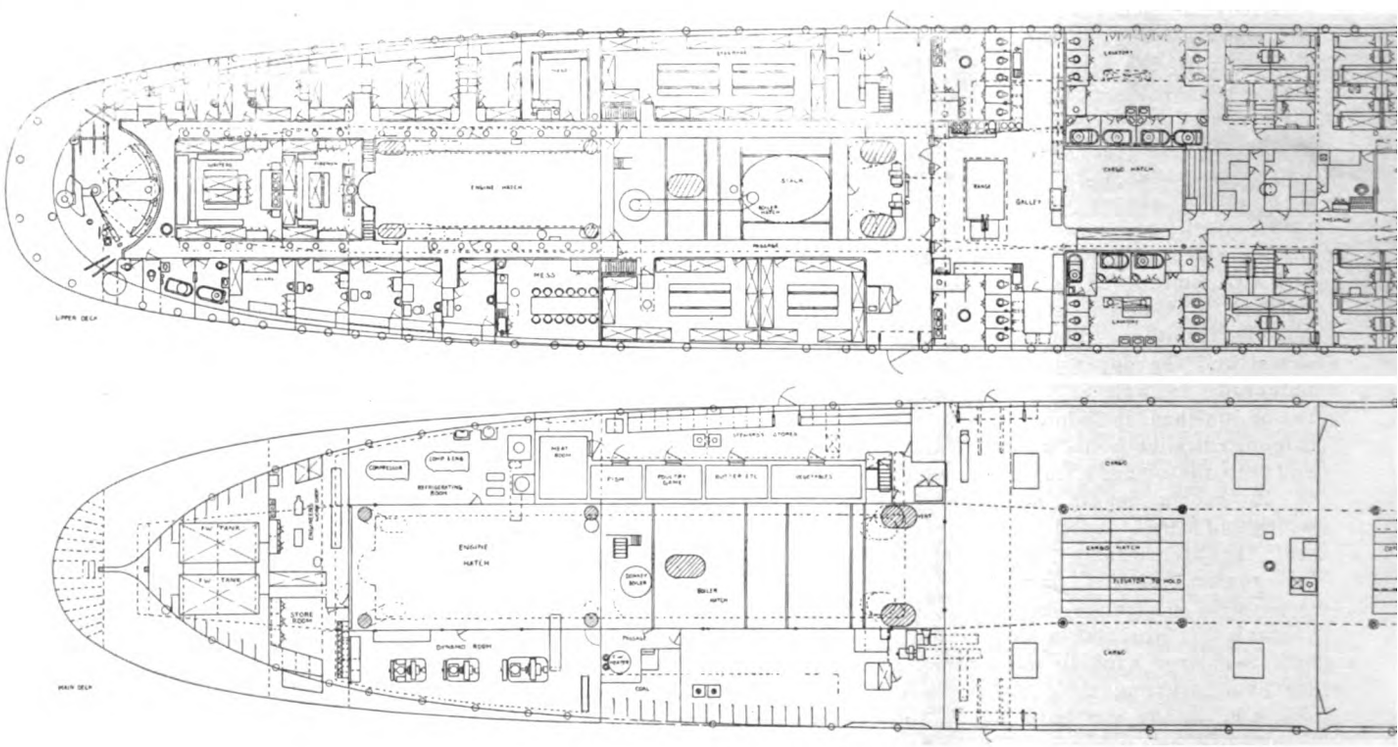
Below on the upper deck and well forward is the dining saloon, aft of which are first-class staterooms, toilets, pantry, galley, and farther aft are spaces for steerage passengers.

On the bridge deck forward is the smoking room and aft of same are located additional staterooms, wherever possible, arranged in suites.

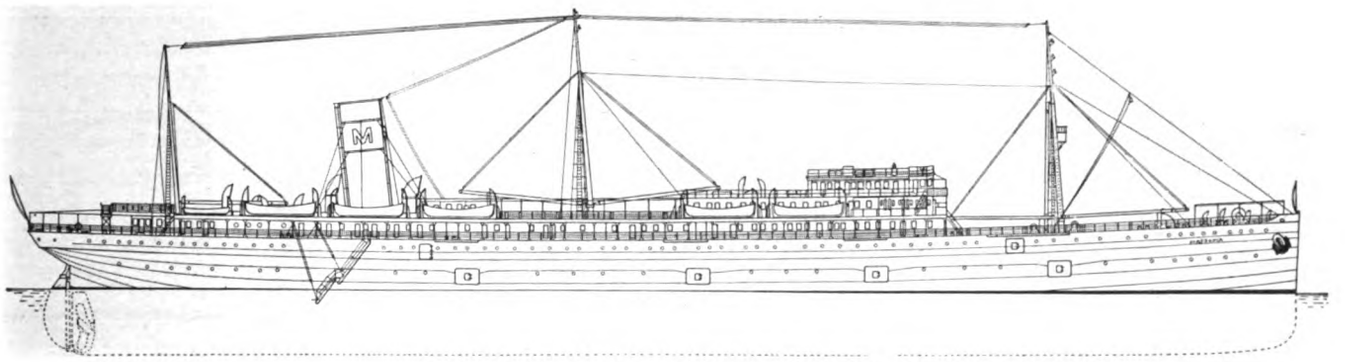
For the safety of those on board, watertight sub-division is provided by a cellular double bottom, 5 ft. 6 in., extending full length between peak bulkheads as well as by seven transverse watertight bulkheads.

Ballast is provided for in the cellular double bottom, which is subdivided into tanks aft for the storage of fresh water, while forward the space is devoted to the storage of fuel oil.

The vessel is constructed on the ordinary transverse frame principle—10-in. channels being spaced 28 in. centers in general, except somewhat closer in forehold, and in fore and aft peaks, where 8-in. channels are spaced 24 in. on centers. Three side



SECTIONAL VIEW OF UPPER A



OUTBOARD PROFILE OF STEAMER MATSONIA

stringers are fitted in holds to either side. The floor plates in cellular double bottom are fitted on every frame. The deck beams vary, 8-in. channels for main deck, 7-in. channels for upper and shelter decks, and 6-in. angles for the bridge deck, fitted to every frame, while in bridge deck house 4-in. angles are spaced 30 in. on centers.

Two rows of wide-spaced pillars and girders are adopted in holds, on main deck and on upper deck aft of passengers' quarters, but throughout passenger quarters smaller stanchions are used. A bilge keel extends on each side for a length of 250 ft. amidships.

The propelling machinery consists of one four-cylinder, triple-expansion engine, 8,500-i. h. p. at 80 r. p. m., with cylinders of 35 in., 61 in., and two 81 in. in diameter, having a 66-in. stroke. The propeller is of the right-handed, built-up type, with manganese-bronze blades and a cast iron hub. The main condensers are of the independent cylindrical type.

The auxiliary machinery consists of one centrifugal circulating pump, an independent air pump, two independent direct-acting feed pumps, two 25-ton evaporators, a distiller, feed filter and heater, bilge and ballast pumps of large capacity and general service, sanitary and various other pumps. The steering gear is of the Brown steam tiller type and is equipped with complete telemotor control.

The ship is heated and thoroughly ventilated throughout. The system of heating is the usual two-pipe steam with radiators in social hall, ladies' lounge, and writing room, while in the dining saloon and smoking room sill heaters and seat coils are installed. Electric heaters are provided for staterooms.

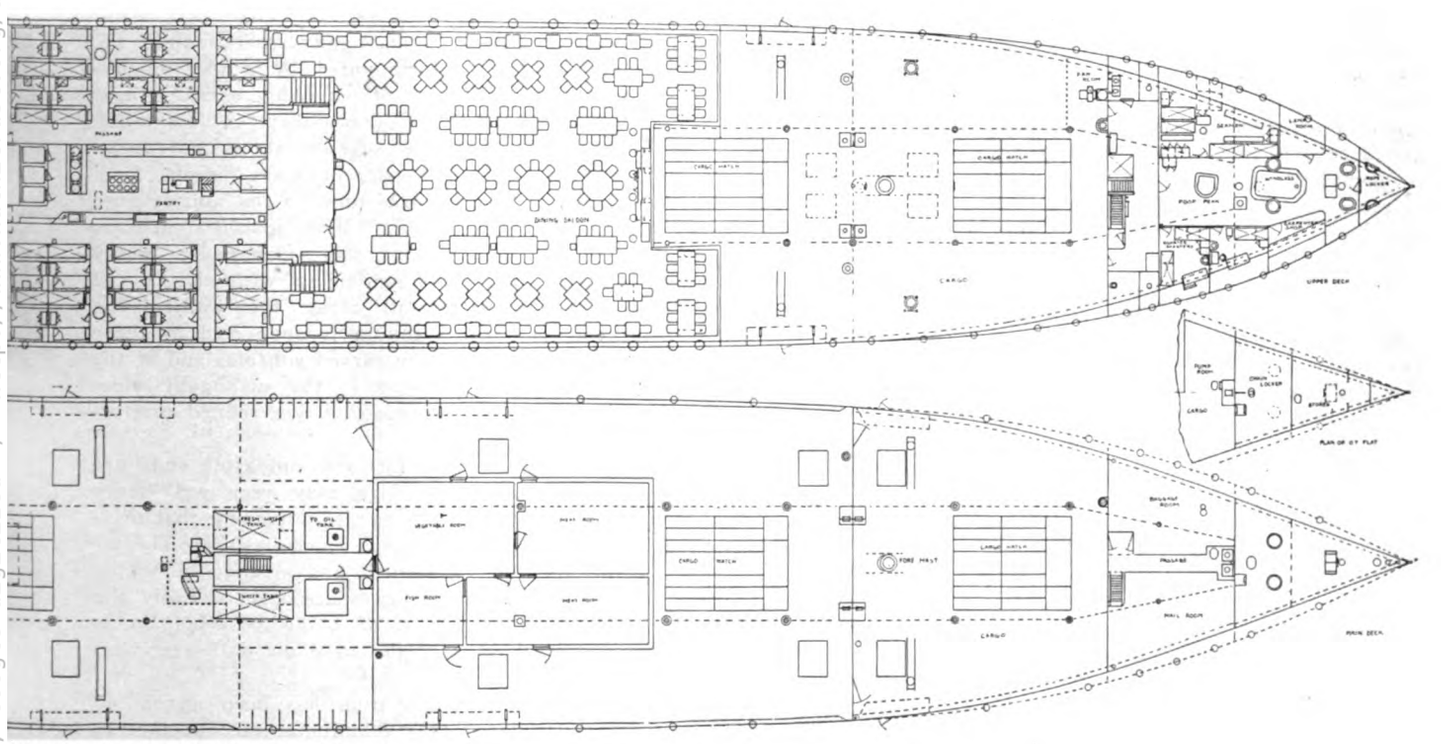
For forced ventilation, one fan supplies fresh air to the staterooms on the upper deck and another to the fruit cargo spaces. Five other fans thoroughly exhaust all foul air from galleys, toilets and cargo spaces and serve to ventilate the dining saloon and other spaces below decks.

Electricity for lighting and power purposes is supplied by two 30-k. w. and one 50-k. w. engine-driven generators.

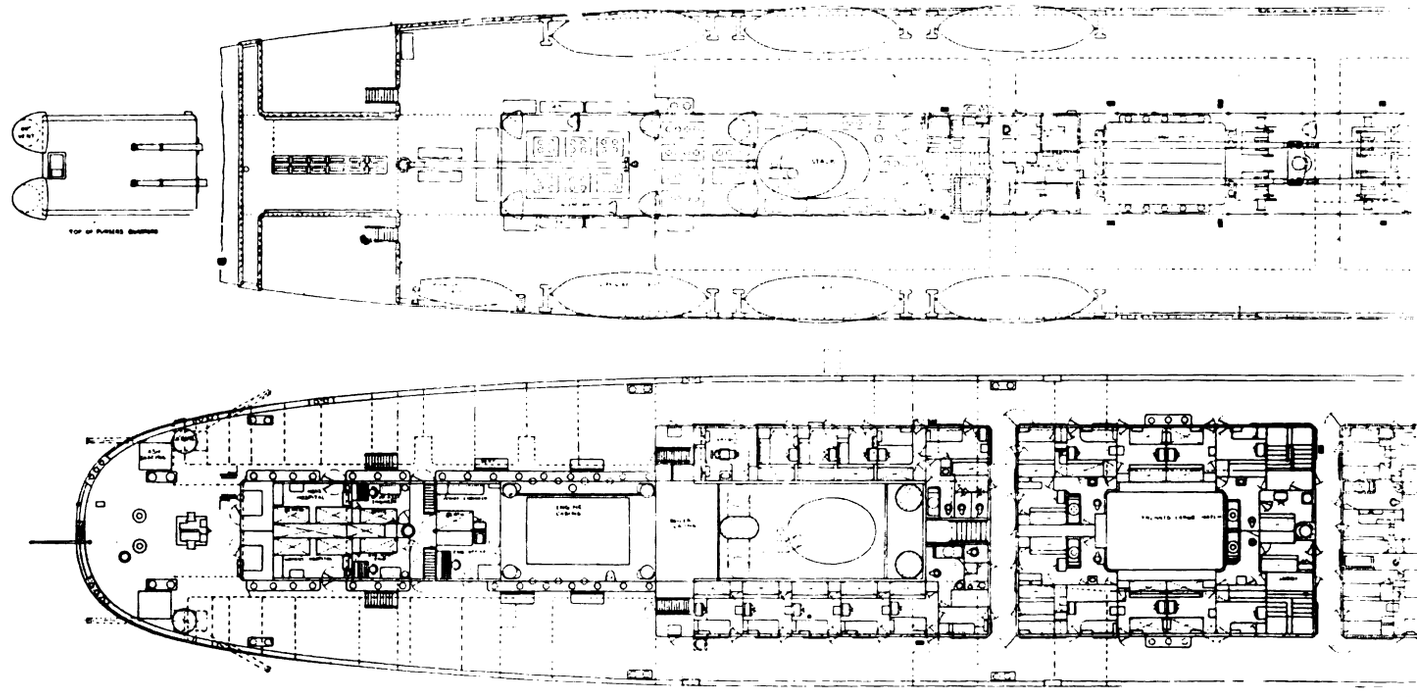
The refrigerating plant is equipped with two 10-ton refrigerating machines with all necessary piping and cold storage rooms. Drinking water is circulated through coils to public spaces.

Life boat accommodation is provided for all on board by means of nine 28-ft. metallic double-ended boats and one 28-ft. wooden power boat for towing the fleet of life boats. In addition, there will be a work boat. All are carried under patent davits.

For loading and discharging cargo the ship is provided with two cargo ports on the upper deck and four on either side on the main deck, as well as two cargo hatches forward on shelter deck and two trunk hatches located



AIN DECKS OF STEAMER MATSONIA



SECTIONAL DRAWING OF DECK PLAN OF STEAMER

about midships on the bridge deck. The last two will be supplied with electric elevators for the handling of sugar cargoes.

To the foremast are attached four 8-ton booms and one 50-ton boom, mainmast four 8-ton booms, all for handling cargo, while to the mizzenmast is attached one 8-ton boom for handling engine room weights.

The booms on the fore and mainmasts are operated by means of eight 7-in. by 10-in. steam winches, four to each mast, while the boom on the mizzenmast is operated by means of an 8-in. by 10-in. steam winch.

A powerful steam windlass with vertical capstan attached is located forward.

Steam is generated in three single-ended Scotch boilers, each 13 ft. 6 in. in diameter and 12 ft. long, containing about 6,000 sq. ft. heating surface, and six Babcock & Wilcox water tube boilers, containing 22,800 sq. ft. heating surface.

The boilers are to carry working pressure of 230 lbs. per square inch, but are designed and built for 250 lbs., and operate with oil fuel, mechanically atomized, under natural draught.

The oil fuel system is of the Newport News Shipbuilding & Dry Dock Co. type, which has been developed by considerable experiment at the ship yard. This system has been fitted to several of their recent ships and has given extremely satisfactory results under both natural and forced draught.

An elaborate outfit of machine tools is fitted in the engineer's work shop.

The full complement of oil tanks for engine room are of sufficient capacity for carrying lubricating, cylinder, refrigerating engine oils, etc., for a 60-day run.

About midships on the upper deck are located spaces for the accommodation, of steerage passengers. The rooms are large and roomy, and special attention has been given to their ventilation.

Forward of these rooms and completely separate from same are first-class staterooms. These, together with the ones located in the deck houses on the shelter and bridge decks, are panelled in a simple design in white. The white enameled berths, the mahogany furniture, the green carpet, all combine with the cretonne window hangings in giving a very cool and restful effect.

Passenger Quarters

Wherever possible, private baths are arranged and all rooms are arranged conveniently to bathrooms. In many cases, rooms adjoining are so arranged that they may be thrown into private suites.

Ten special staterooms are provided, each with its own bath and finished in an individual style of decoration. There are two suites panelled in bird's eye maple, the long panels displaying the natural beauties of the wood to great advantage. Six other rooms are panelled in mahogany with mahogany or silk tapestry panels varying in tone and color, and two are finished in white colonial, one with blue and the other with pink silk tapestry panels. The special rooms are all fitted with heavy brass bedsteads and other specially designed furniture in mahogany.

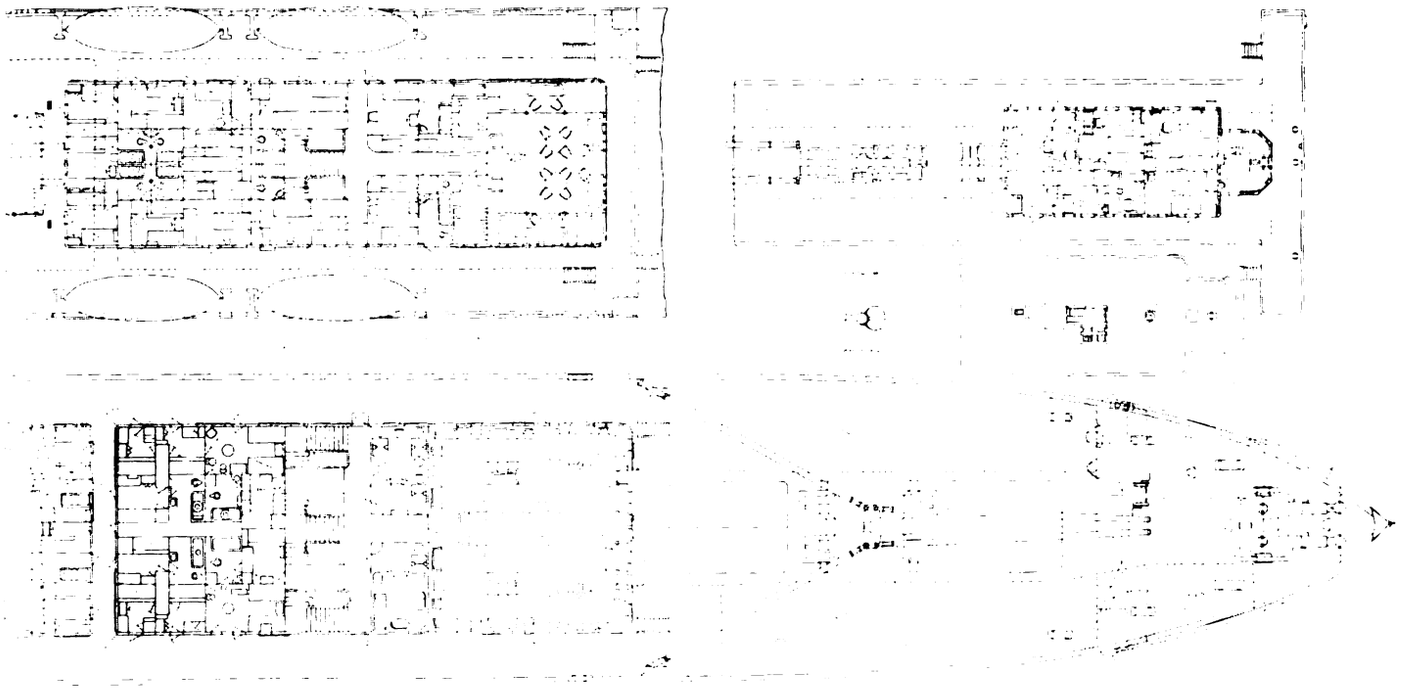
In addition to these, there are eight other rooms, finished more elaborately than the ordinary first-class staterooms and not quite as elaborately as the special rooms.

The officers' quarters on the bridge are neatly and tastefully treated and the captain's room forward is in close proximity to the wheel house, which is modern in every particular and fitted with every known appliance for ship control.

Well forward and extending across the ship on the upper deck is the dining room, arranged to accommodate 206 persons at one sitting. The style of decoration is of the late Renaissance period. There is a wainscot of mahogany surrounding the room, surmounted by a pleasing arrangement of panelling, enriched here and there by ornament in low relief. The color scheme above is carried out in a series of grays ranging from a rich warm tone to the almost pure white ceiling. Wide spaced stanchions are enclosed in mahogany, richly carved, harmonizing with the carved pilasters all along the walls. The beamed ceiling is supported at these columns by carved consoles and at the forward end is the mahogany sideboard of massive, yet refined proportion.

At the forward and after ends are alcoves, which may very well serve for dinner parties, affording that privacy sometimes much desired. The tables are small and arranged to allow all necessary space and to avoid the appearance of being crowded, as is generally the case on passenger vessels.

An innovation has been introduced in placing a buffet at the entrance to the dining saloon, where one may go



ATSONIA, SHOWING SHELTER DECK AND DOCKING BRIDGE

between regular table settings and obtain light lunch. On either side of the dining room light enters through a series of cathedral glass windows suffusing into a warm glow over the entire room.

These sash are provided with ventilating grilles and these together with a system of exhaust ventilation will keep the room cool at all times.

Immediately aft of the dining saloon is the stair hall, treated in modern English. This same hall is carried up for three decks and the spacious stairways connecting same have wrought iron grilles of simple design. The walls are panelled in mahogany, large panels being used which, in their very modesty, only serve to enhance the rich grain of the wood and to emphasize the beauty of the smaller carved panels, which are fitted in combination with them.

Over the stair leading to the bridge deck is the ship's clock, handsomely mounted in a large carved panel.

On the shelter deck forward of this stair hall is the social hall. The style here adopted is of the period known as Empire, with mahogany panelling and gilt ornament, enriching the warm color of the mahogany and bringing out the quiet dignity of the period it represents.

Furniture quietly designed and faithful to the period and upholstered in dark green tapestry and silk brocade complete the desired effect.

At the forward end of the social hall are alcoves filled with palms and ferns, bringing that touch of life and sunshine to those within. A pianola-piano is also placed at the disposal of the passengers and for use in special concerts.

Just aft of the social hall and to either side are the ladies' lounge and the writing room. These rooms are treated in the French style prevalent in the time of Louise Seize, which style affords an especially rich treatment of wall surfaces with panels of those light and elegant moldings common to the period. For the ladies' lounge, the color scheme is carried out in old ivory and blue, the wall panels being of a blue-figured silk tapestry. The furniture is of mahogany and upholstered in a heavier tapestry of harmonizing color and the carpet in brown gives the sufficient background to the setting. Even the silvered lighting fixtures have been especially designed and are faithful to the period.

The Writing Room

The writing room is similar in design and style to the ladies' lounge, but its color scheme is carried out in tones of buff and golden browns. Both rooms are separated from the social hall by French casements and are richly hung with brocaded tapestries. A number of writing desks are provided in both rooms for the convenience of passengers.

On the bridge deck forward and directly over the social hall is the smoking room. Here the style followed is one of the early English styles of the fifteenth-sixteenth centuries — the Tudor Gothic.

The woodwork is essentially oak, stained an antique brown and the wall panels are enlivened here and there by carvings peculiar to the period.

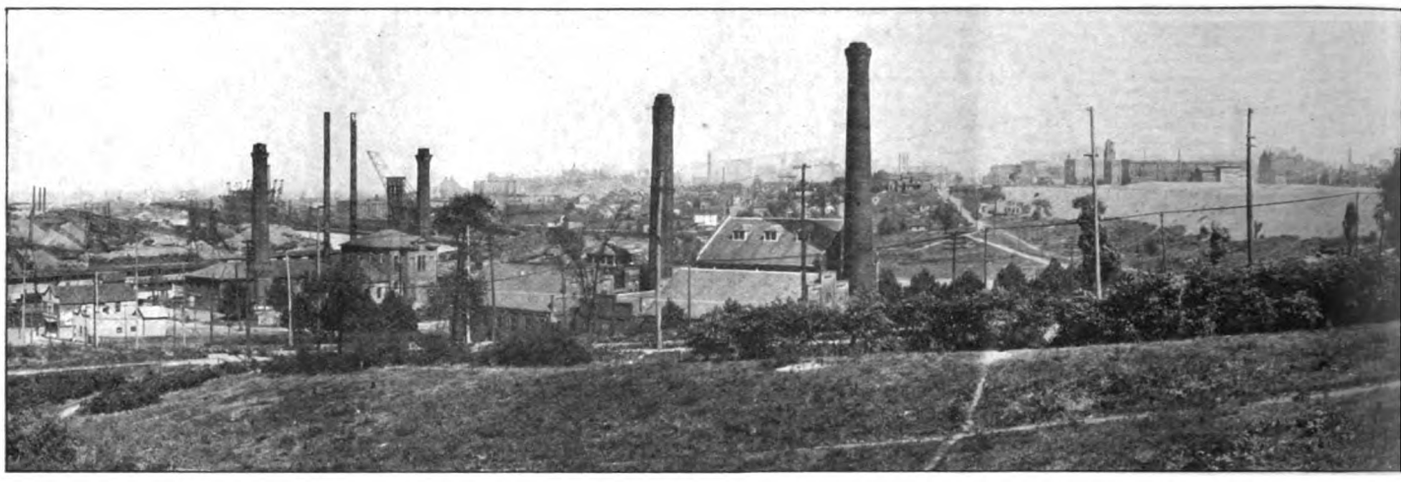
The idea is carried out in the arrangement also and four alcoves are provided, with low seats facing across a heavy oak table, where one may sit, and at the alcove ends are long, narrow perpendicular windows, affording an unobstructed view out over the water. The mantel deserves especial mention. Over its mantel shelf the Royal Hawaii coat of arms against a robe of ermine and surmounted by the tiara is carved in solid oak, making a splendid effect.

The soft tapestry window hangings add a touch of sombreness to the whole, so that one unconsciously feels the spirit of the times it is intended to represent.

It has not been the aim of the decorators to impress the passenger with a false magnificence, but rather to surround him with that quiet simplicity, which goes far toward making the sea voyage the delightful event it should be.

The ship as a whole may be well said to be a long step in advance of anything yet attempted for the trade in which she will engage. Her hull, machinery, cargo handling appliances and interior arrangement and decoration each represent a vast amount of study on the part of the owners and builders and it is confidently expected that the traveling public will rapidly discover and approve of the effort in their behalf.

The vessel is fitted with foundations for four 6-in. guns and otherwise arranged as a vessel of the second class under the Postal Sibsidy Act of March 3, 1891, to which class she is entitled on account of her size and speed.



PANORAMA VIEW OF CLEVELAND'S OUTER HARBOR, TAKEN FRO

Perry's Victory Celebrated

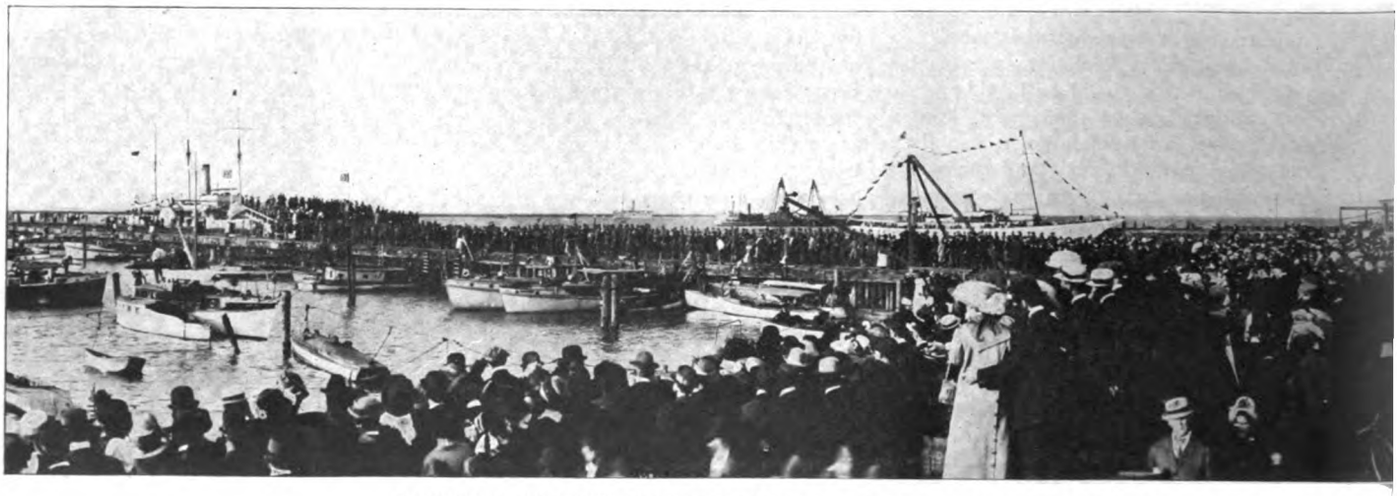
An Imposing Array of Bulk Freighters to be Seen in the Outer Harbor at Cleveland

THERE has never been witnessed on the Great Lakes a scene paralleling that which was to be observed in the outer harbor of Cleveland on Sunday morning, Sept. 14, marking the opening of the celebration in honor of the one hundredth anniversary of Commodore Perry's victory over the British fleet at Put-in-Bay, Lake Erie. When the battle of Lake Erie was fought, there were few vessels on Lake Erie, not many, and none of them larger than Perry's flagship Niagara, which looks like a tiny morsel alongside the great ships of today. At that time there was nothing on Lake Superior larger than the birch bark canoe of the Indians and the batteaux of the French voyagers, and there never had been anything larger there.

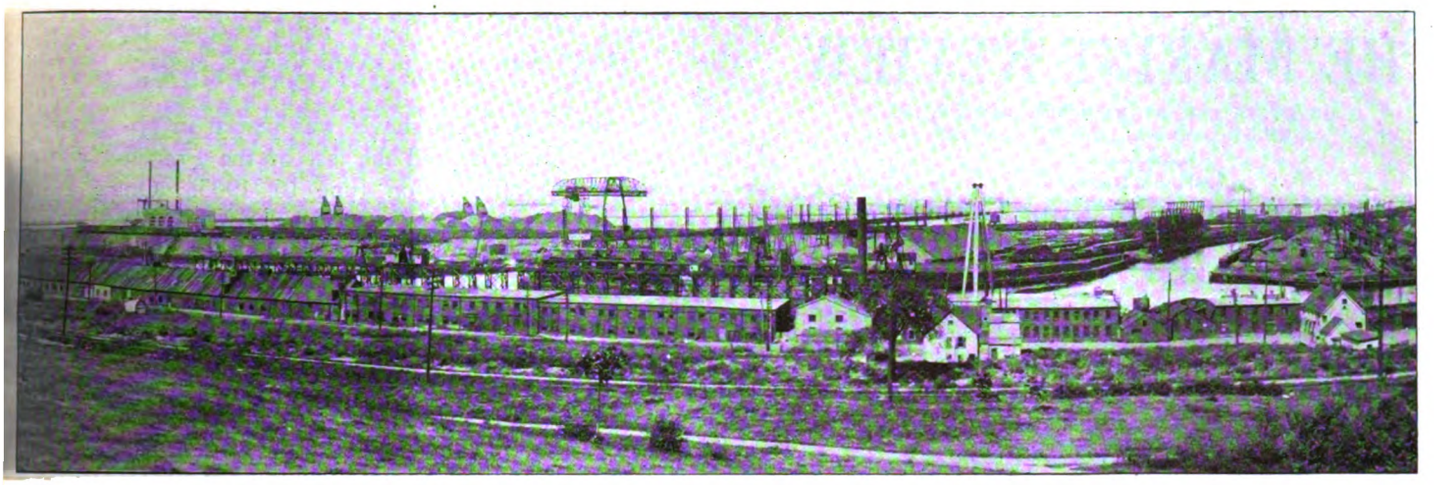
The view, therefore, that presented itself to the beholder in the harbor of Cleveland on Sept. 14 was impressive and significant. Certainly few people have ever seen a finer array of bulk freighters. The exactions of the trade are such that vessel owners cannot afford to delay the operation of their ships as time in the short season which obtains on the lakes is money; yet there were several sufficiently patriotic and public spirited to delay their ships for the better part of the day. These great freighters, loaded with either coal or ore, lay at anchor until the Niagara hove in sight in tow of the gunboat Wolverine and convoyed by the gunboats Dorothea and Essex and the revenue cutter Morrell. Then they gradually swung into line and formed part of the procession from the pier head to Gordon park. The great sidewheelers of the Detroit & Cleveland Navigation Co. and the Cleveland & Buffalo Transit Co. added to the impressiveness of the spectacle, as did also a flotilla of tugs under Captain Phillip Broderick, of the Great Lakes Towing Co. The naval division was commanded by Commander T. B. Bolton, of the naval reserve ship Dorothea. The bulk freighters were under the general direction of Capt. W. W. Smith, superintendent of the Pittsburgh Steamship Co.

When Gordon park was reached the bulk freighters dropped out of line and proceeded to the various ports to which they had been previously assigned. The bulk freighter William P. Palmer was the flagship of the bulk freight fleet, which consisted of the following vessels:

Boat—Captain.	Carrying capacity gross tons.
W. P. Palmer, A. F. Chambers	12,000
F. E. House, J. F. Parke	12,000
B. F. Berry, C. C. Balfour	10,000
W. B. Schiller, J. LaFrambo.se	12,000
Isaac Ellwood, G. H. Bowen	8,112
Edenborn, T. J. Cullen	8,170
Ericsson, Allen Collins	5,957
Peter Reiss, C. P. Hahn	9,000
J. J. Sullivan, S. B. Massey	10,500
Sultana, J. E. Cotterell	5,000



GREETING PERRY'S FLAGSHIP NIAGARA AT THE FOOT OF EAST NINTH STREET, CLEVELA



EDGEWATER PARK ON THE DAY OF THE PERRY MEMORIAL CELEBRATION

F. C. Ball, W. C. Brown	10,000
Rensselaer. C. D. Secord	7,512
Griffin, Alex Brown	2,648
John B. Cowles, R. J. Lyons	10,000
Cepheus, G. Dupuie	7,000
E. Y. Townsend, Edw. Sullivan	11,800
W. G. Pollock, W. L. Hamilton	7,500
Matoa, H. D. McLeod	3,104
Henry B. Smith, James Owen	10,000
G. C. Barnum. W. G. Maltby	9,204
Geo. B. Leonard, E. E. Carelton	6,500
Joseph Sellwood, R. C. Jackson	9,600

The Niagara was towed to the foot of East Ninth street, where appropriate exercises were conducted under the direction of Harvey D. Goulder, who had charge of the entire day's proceedings and was largely responsible for the number of ships that took part in it. The speakers included President Charles F. Thwing, of Western Reserve University, Father O'Reilly, Rev. Frank W. Luce and Mayor Newton D. Baker.

American Krupp-System Diesel Engine

The American Krupp-System Diesel Engine Co. has been incorporated under the laws of the state of Delaware to manufacture and sell Krupp Diesel engines. John L. Bogert, Room 1619, 165 Broadway, New York, is the company's engineer. It is understood that the company has secured the exclusive rights for the United States and its territorial possessions of all the inventions, patents, trade marks, designs and drawings of the Krupp firm in so far as they relate to oil engines, and especially to the Diesel type. It is understood to be the intention of the new company to build both stationary and marine engines. They will aid to replace the gasoline engine with the Krupp Diesel engine wherever it is practicable that the great saving in fuel cost inherent in such change may be realized. A fuel cost of 2 cents per horsepower-hour with a gasoline engine using gasoline costing 16 cents per gallon would be cut to one-fifth of one cent per horsepower-hour with a Krupp-Diesel engine using fuel oil costing three cents per gallon. It was in 1893 that Dr. Rudolph Diesel submitted his theory to the Krupps of how a more perfect heat motor than any yet produced could be designed. The first engine of the Diesel type was built in the Krupp plant and a great deal of money was spent by the Krupps in perfecting the type. No information is as yet obtainable as to where the American Krupp System Diesel Engine Co. intends to locate in the United States for the manufacture of the engines.

New United Fruit Liner

The United Fruit Co. will have three of its latest steamers on the West Indian route during the coming winter, the Pastores, Tenadores and Calamares, the last named having been launched on the Clyde. The company intends to make quite a rare departure in its series of special 18-day cruises from New York to West Indian ports in that it will abolish the table de hote system altogether and all meals will be served a la carte. The cost of this 18-day cruise will be reduced from $175 to $125 and with the introduction of the a la carte system passengers will pay for whatever meals they take. An exclusive a la carte service is an entirely new departure in ocean travel and the innovation will doubtless be watched with great interest. These new steamers are designed especially for tropical cruising as all staterooms are outside.

The Union Iron Works, San Francisco, Cal., is building a gasoline-driven steel barge for the Standard Oil Co. to be used in the harbor of San Diego.

ON SUNDAY, SEPT. 14. THE NIAGARA IS DIMLY SEEN IN THE CENTER BACK GROUND These Photos by Miller Studio, Cleveland.

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October, 1913

Progress on Panama Canal

Steam shovel operations on the Culebra cut were permanently suspended on Sept 10, and all trackage removed. Most of the ties were past saving and were piled into heaps and burned. The pumps which have been maintained just south of Gamboa dyke to free the cut of drainage water have been removed and the building which housed them destroyed. It is estimated that about 600,000 cu. yds. of material remain to be removed by dredges from the Culebra cut section within the original limits of the canal, exclusive of slides. Practically all of this material lies between Cucaracha slide and a point about midway between Empire and Culebra. Slides in this section are showing renewed activity but are regarded in a large measure as having lost their importance because they will become a part of the regular work of the dredges in keeping the channel clear. The remaining material is being drilled preparative to blasting, and most of the blasting will be done after the water is about 8 ft. deep.

Excavation first began in the Culebra cut on Jan. 20, 1882, by the French, and has continued with only six years interruption (1889-1895) to the present time. During the operation of the two French companies about 17,000,000 cu. yds. of material were taken from this section useful to the present line of canal. On May 4, 1904, when the Americans took charge there were about 700 men employed in excavation work using side excavators served by small French dump cars and Belgian locomotives. Work was continued with the equipment left by the French until it could be gradually replaced with modern steam shovels, engines and cars.

The first American steam shovel was placed in operation on Nov. 11, 1904, and the last of the French excavators was discontinued on June 16, 1905. On Aug. 1, 1905, there were 11 American steam shovels at work, but their output was greatly handicapped by lack of proper transportation facilities. Work in the cut did not begin on a large scale until February, 1907, and from that time until 1911, when the maximum output was reached, there was a steady increase in the amount of material excavated, as new equipment was installed.

The following table shows the amount of material removed from the Culebra cut by Americans from the beginning of operations in 1904 to the suspension of steam shovel work on Sept. 10:

Year.	Cu. yds.
1904	243,472
1905	1,084,428
1906	2,702,991
1907	9,177,130
1908	13,912,453
1909	14,557,034
1910	15,398,599
1911	16,596,891
1912	15,028,413
1913 (To Sept. 10)	8,348,190
Total	97,049,601

Efficient aud Smokeless Combustion

One of the most distressing features of urban life is the smoke nuisance, and it is needless to say that most of it is unnecessary. If a furnace is emitting vast quantities of smoke, combustion is inefficient and there is something wrong. Among the great offenders within the city limits are the railroads and in cities having navigable rivers, the tugs. For this reason railway managers, steamship men, designing and operating engineers, and fuel departments of industrial concerns may be greatly interested in the report just issued by the United States bureau of mines as Bulletin 22 on the analysis of mines in the United States with description of mine and field samples collected between July 1, 1904, and June 13, 1910. This report contains the analysis of 5,000 samples of coal taken from 1,500 coal mines and prospects situated in the various coal fields of the United States. Practically all of the more important mining districts are represented in the report.

The purpose of the bureau in publishing and compiling this information is to present reliable data regarding the chemical composition and heating value of the coals. The samples of coals were collected by experienced men according to a definite and uniform system and were analyzed under carefully controlled conditions so that there might be no question as to the relative merits of the different coals so far as this can be obtained by chemical analysis and determination of heating values.

It is well known that an increasing proportion of the coal consumed in the power stations and larger manufacturing plants of the country is now being purchased under specifications based on chemical analysis and calorimetric determinations of heat units. In the purchase of fuels many matters formerly left to chance are now carefully investigated. It is the aim of mechanical engineers to construct furnaces and to arrange the heat absorbing surfaces in a furnace with reference to the peculiar character of the fuel which is to be burned.

Noting the composition of the fuel and constructing the furnace with reference to it, he can assure efficient and smokeless combustion. Moreover, in any particular market, the choice of coal generally is limited by its quality and by freight rates to one or two fields in which the character of the coal bed is comparatively uniform. Having on hand a representative analysis of the coal from a given bed in any particular district, the engineer can determine whether the coal he receives comes from the bed and the district stated, and whether it is being prepared for market as carefully as it should be. Wide variations in the composition and heating value of the coals from different districts and from different beds make analyses that are comparable, because of the care taken in sampling and analyzing the coal, almost indispensible to engineers having to install boiler or gas-producer plants in different cities, and also to railroads and steamboat companies, and to the engineers and purchasing agents of the various departments of the United States government.

The report just issued by the bureau of mines is in two parts, one giving the methods used in collecting and analyzing the samples, and the results of the analyses, and the other giving the exact location from which each sample of coal was taken, together with a description of the characteristic features of the coal bed at the point of sampling, the nominal capacity of the mine, and such notes on the preparation of the coal as might be useful to consumers. The data contained in these two volumes is not equaled in scope and detail and in value for comparative purposes by the figures that have been published by any other coal-producing country in the world. The governments of some of these countries have published analyses of coals from different mines and from different districts, but, with few exceptions, the samples of coal were not collected and analyzed under a uniform system that would make the results comparable in all respects, and no country has attempted to publish such a large number of analyses that would be comparable because of the care taken in collecting and analyzing the samples.

Abandoning Queenstown

The White Star liner Olympic sailed from Queenstown on Sept. 25 without taking on board 200 passengers and 1,500 sacks of mail waiting to be shipped to New York. Of course the passengers immediately held an indignation meeting and were loud in their denunciation of the treatment meted out to them and telegrams full of fire were sent to the White Star company. Now, if these passengers would stop and think for a moment, the last thing in the world the White Star Line or any other steamship company would do would be to discommode its passengers, and especially such a distinguished lot of passengers as were waiting at Queenstown. The fact of the matter is that the harbor of Queenstown is no safe place for the giant liners which have been created during the past few years and it would be a mighty foolish undertaking for the steamship company to risk so valuable a piece of property as the Olympic in such a dangerous waterway. The company did all that it could in the premises. The Olympic anchored in the roadstead outside of the harbor, but the masters of the tenders conveying the passengers considered the heavy swell too dangerous to attempt to put them the smoother water inside of Roches Point. The captain of the Olympic declined to follow them into aboard the steamer and turned around and made for the harbor but he waited outside until the tenders had returned to Queenstown and disembarked their passengers.

The White Star Line, in doing what it did, did only what was prudent and the passengers suffered no material delay as the Adriatic was sent for them the next day.

In this policy the White Star Line is simply following the lead of the Cunard Steamship Co., which has definitely abandoned Queenstown as a port of call for its express steamers Lusitania and Mauretania, notwithstanding the fact that it had a contract with the British postal service to call there regularly for the mails. The matter was gone into pretty thoroughly by the Board of Trade and the nautical adviser of the post office department, and it was the conclusion that it was hazardous even in fine weather for these steamers to proceed into the harbor at any time near low water and that it was almost impossible to select a spot in which they could swing clear of shallow water at single anchor. Obviously, the gravity of the situation would be greatly enhanced in heavy weather. The circumstances that caused the Cunard Co. to realize that they were taking an unwarrantable risk occurred to the Mauretania last spring when she entered Queenstown harbor about one and one-half hours after high tide, that is to say on the ebb, and she anchored with her bow pointing up harbor. The violence of the gale overcame the influence of the tide and she was swung athwartship of the harbor with her stern very close to the shoals. In this position she was practically fixed and could not use her screws for turning around to proceed to sea but had to wait the flood tide to swing her. It is no wonder, therefore, that the Cunard Co. has definitely abandoned Queenstown and the wisdom of the White Star Line in declining to send the Olympic into the harbor during heavy weather cannot be disputed.

Lighthouse Tender Laurel

Bids were opened by the Lighthouse Department, Washington, on Sept. 2 for the construction of the wooden light house tender, Laurel, the dimensions of which are as follows:

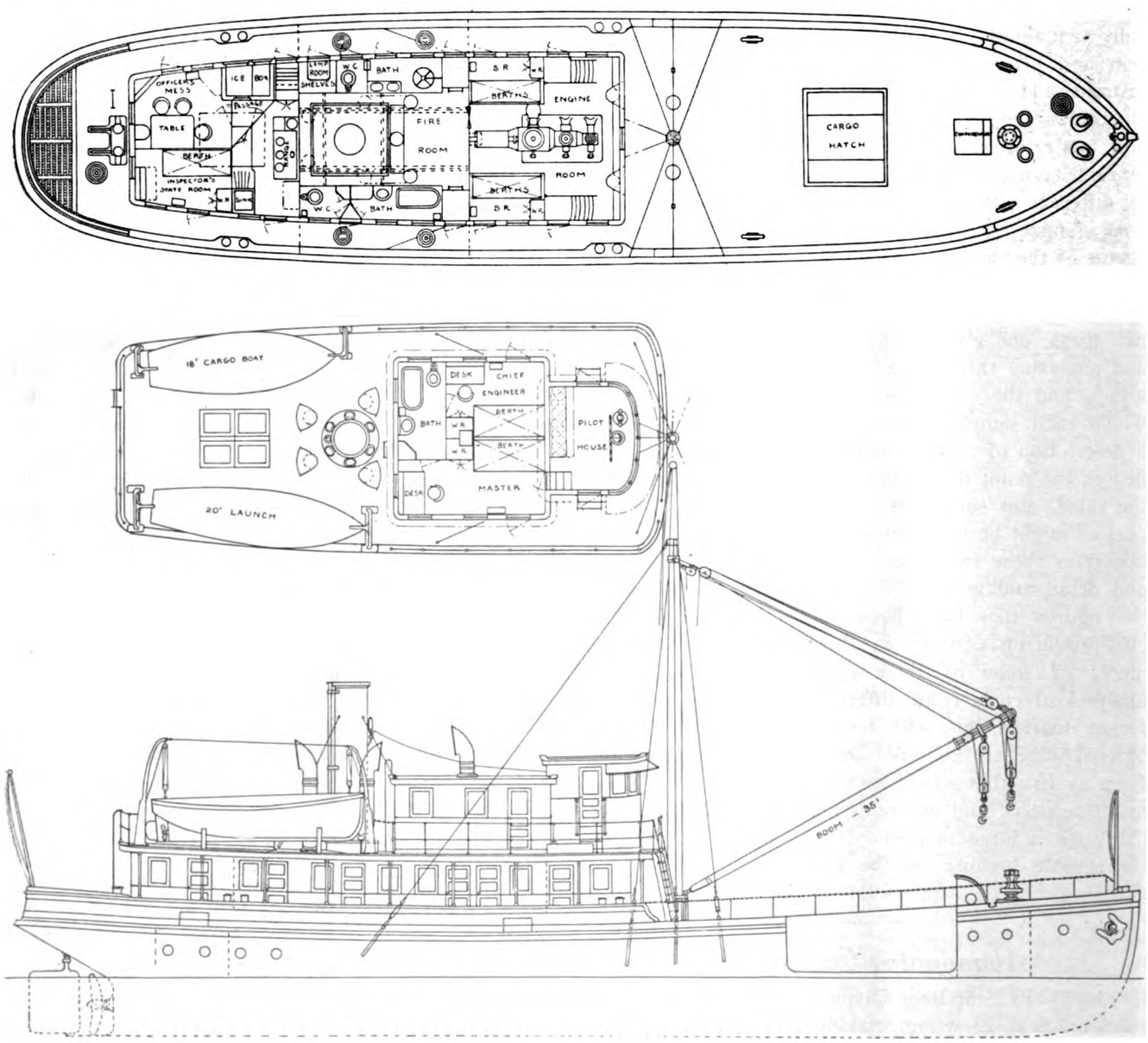
Length over all, 104 ft. 6 in.
Length on load water line, 95 ft.
Beam, molded outside of planking at deck, 22 ft.
Depth of hold from main deck, 8 ft. 10 in.
Displacement at normal load, 5 ft. 6 in., 190 tons.

The hull is to be subdivided by a watertight bulkhead at the forward end of the engine room and at the after end of boiler room with a non-watertight bulkhead between the two compartments. The keel, floors and frames are to be of white oak and the keelson and deck beams of yellow pine. The tender's machinery will consist of a triple-expansion engine with cylinders 8 in., 13 and 21 in. in diameter, having a common stroke of 16 in., supplied with steam from one Almy water tube boiler having 30 sq. ft. of grate surface and 950 sq. ft. of heating surface, constructed for a working pressure of 200 lbs. per sq. in. One independent surface condenser will be installed with approximately 350 sq. ft. coaling surface contained in a steel shell, 2 ft. 11 in. in diameter and 4 ft. in length. One Blake air pump and one Blake feed pump will be installed. The circulating pump will be of Waters-Colver Co. make. The sanitary pump will also be of the Blake type.

The bids received for constructing the tender were as follows: Spedden Ship Building Co., Baltimore, Md., $41,000; Welin Marine Equipment Co., Long Island City, N. Y., $38,700 for hull only; the Greenport Basin & Construction Co., Greenport, N. Y., $58,400. The contract was awarded to the Spedden Ship Building Co.

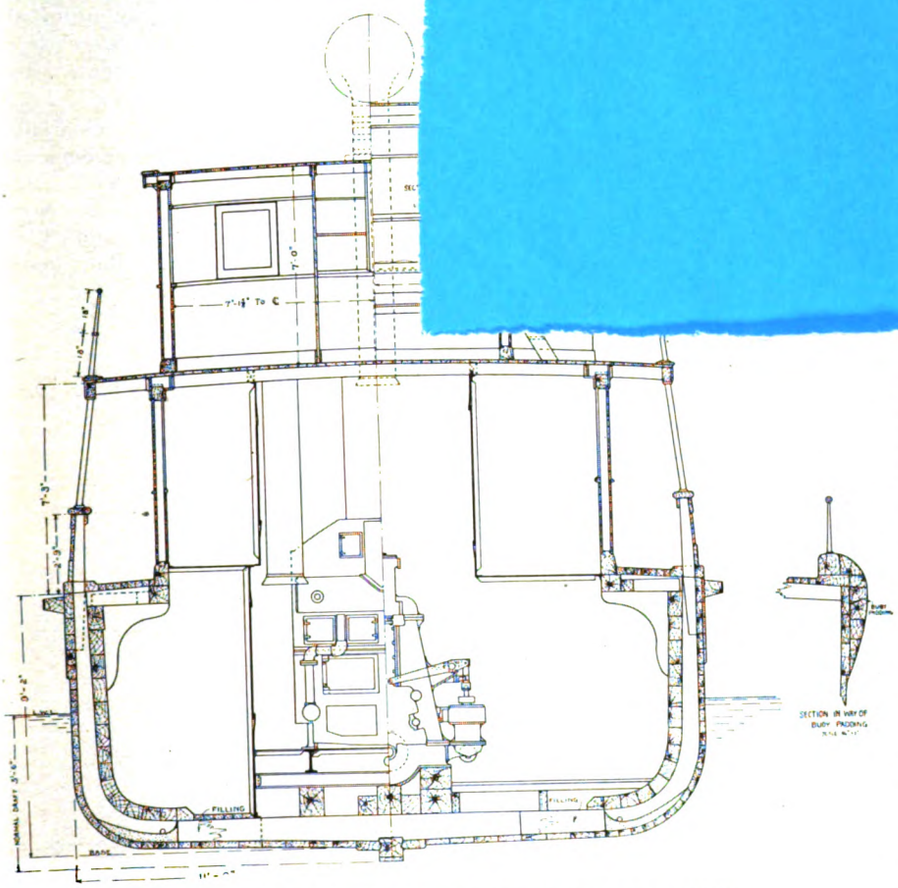
The Arch Principle of Ship Construction

Furness, Withy & Co., Ltd., of West Hartlepool, have just placed orders for two cargo ships, to be built on the Arch principle of construction under the Ayre-Ballard patent, and each of a deadweight carrying capacity of about 3,400 tons. One of them will be built by the North of Ireland Shipbuilding Co., Ltd., at Londonderry, and the other by Osbourne, Graham & Co., at Hylton, near Sunderland. The builders take a license from Messrs. Swan, Hunter & Wigham Richardson, Ltd., and Maxwell Ballard, of Wallsend, who are the joint proprietors of the patent and Mr. Ballard is supplying the designs. It is a matter of considerable interest to ship owners to know that, although the Arch principle of ship construction is of comparatively recent date, yet during this year alone three ves-



OUTBOARD PROFILE AND GENERAL ARRANGEMENT OF LIGHTHOUSE TENDER LAUREL

sels of this type have been taken in hand at various shipyards. One was delivered to Canadian owners a few months ago; a second, similar ship, is under construction by the North of Ireland Shipbuilding Co., at Londonderry, and the third for the Donald Steamship Co., of New York, is now receiving her finishing touches at the yard of Messrs. Osbourne, Graham & Co. This is striking evidence of the increasing popularity of the Arch principle of ship construction, showing that ship owners do really appreciate the economy to be effected by using this type of ship. The principle ad-



MIDSHIP SECTION OF LIGHTHOUSE TENDER LAUREL

vantages of building on the Arch principle are briefly a large reduction in first cost, cargo holds free of obstructions and increased carrying capacity combined with very low net tonnage. Other special points of a more technical nature might be noted, namely increased strength, better stability, greater freeboard, an unusually high deck platform and no so-called "wells" either forward or aft of the bridge amidships for seas to fill.

Turbo-Generators on a Ferry Boat

The new ferry boat, Leschi, building for the Seattle Port Commission, is rapidly nearing completion for service between Leschi Park, Bellevue and Medina, on Lake Washington just back from Puget Sound, bring producers over a considerable tance into direct communica Seattle.

This vessel will h tions for 1,500 as seve She ft

supplied by two Terry turbo-generator sets, one of 2 K. W., and the other 7½ K. W. The general contractors for this boat, Buxbaum & Cooley, purchased these sets through the Cooley Engineering Co., Seattle agent of the Terry Steam Turbine Co., Hartford, Conn.

The Leschi is said to be the first steel vessel of her class built on Puget Sound. She has been built from designs of Fred A. Ballin, naval architect, at the yard of J. F. Duthie, and has already been knocked down, with each piece marked for proper identification, so that construction at Taylor's Mill on Lake Washington may be made with a minimum of confusion. This method of procedure

etc., and above this is the navigating bridge with wheel house, chart house and wireless house. The crew are placed aft in poop, with lavatories, shower bath, separate rooms for seamen, firemen, oilers and petty officers, and separate messrooms for firemen and seamen.

The deck machinery has all been made by the American Engineering Co., of Philadelphia, and comprises 11 heavy steam winches, steam windlass and steam steering gear placed in a house on poop controlled from the bridge by means of telemotor gear.

The propelling machinery is of the quadruple-expansion type with three large boilers working at 220 lbs. pressure, fitted for burning oil fuel Dahl system, and arranged for burning either coal or oil fuel. Auxiliary machinery in engine comprises large forced draft fan with duplicate engines, large auxiliary condenser, powerful feedwater injector, three Blake & Knowles special feed pumps, large navy type evaporator and exhaust feed heater by the Griscom Spencer Co., several pumps, Worthington type; twin dynamos by General Electric Co., duplicate refrigerating machinery by the Brunswick Refrigerating Co., air cooling machinery by the Schutte-Koerting Co., workshop with lathe drilling press, etc., McNab's direction and speed indicator.

A search light is fitted on upper bridge, and powerful electric lights each side of masts for cargo purposes. The vessels are built to highest class and to the design and specifications of the company's marine superintendent, D. Mathieson.

was run at 22.556 and the fourth at 22.338. The concluding mile was finished in 22.567. Her contract requirements are 22.50 knots. The battleship was prevented from completing a thirty-hour run through some minor accident. The Rivadavia is 585 ft. long and 98 ft. beam. Her trial displacement was 27,600 tons and full load displacement 30,600 tons. Her armament consists of twelve 12-inch guns, twelve 6-inch guns and sixteen 4-inch guns.

The average of the trial speed runs was slightly over 22.5 knots, the horse power 39,750, and the revolutions 270 per minute. These trials were followed by gun trials and it was found that the structural parts of the ship withstood the shock of firing absolutely without injury. The vessel will be delivered to the Argentine Republic early in 1914.

Engine Repairs to Steamer America

On Friday morning, August 29, the steamer America arrived at the Manitowoc Ship Building & Dry Dock Co. plant, Manitowoc, Wis., in tow of the wrecking steamer Favorite with her high-pressure engine entirely disabled. This happened while the steamer was bound for Green Bay with a cargo of coal.

The crosshead pin strap on the high-pressure connecting rod broke and opened up allowing the piston rod and crosshead to become disconnected from the connecting rod. This happening on the up-stroke allowed the piston to strike the upper cylinder head, fracturing the same badly and

[illegible]hen, under the action of the steam, [illegible] piston was driven downward, strik-[illegible]ard on the cylinder bottom and [illegible]uffing box with the curious [illegible]he threads of the piston [illegible]irely stripped and the [illegible]d fell into the [illegible]d piston [illegible]. In [illegible]hat

ed, which, of course, would offer only half the resistance to shear of a V thread.

As the steamer was entirely disabled R. A. Williams, manager of the North American Steamship Co., owners of the vessel, decided to have her towed to Manitowoc to undergo repairs at the Manitowoc Ship Building & Dry Dock Co. plant.

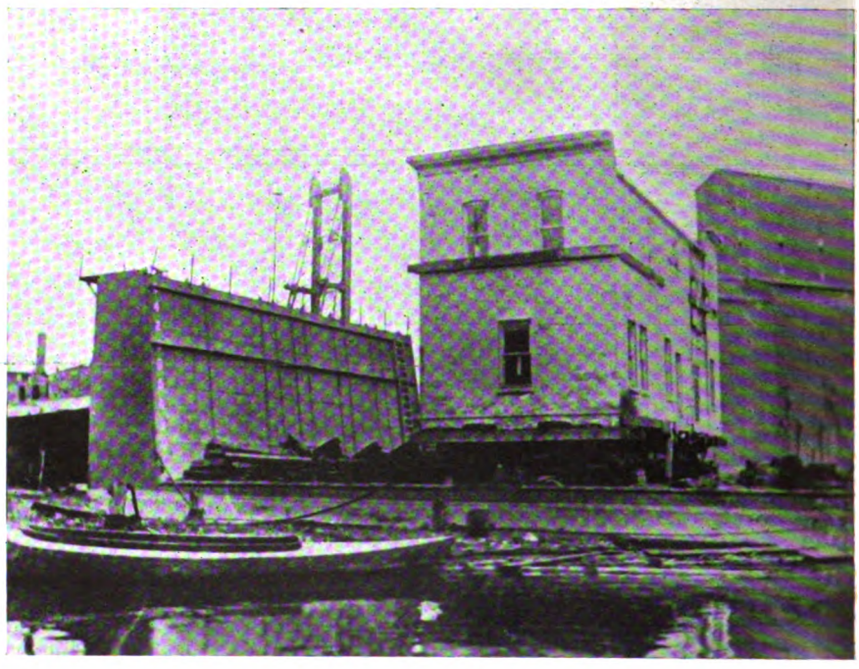
Immediately upon her arrival on the morning of August 29 examination was made and showed that the cylinder bottom was badly cracked, the top and bottom cylinder heads fractured and the piston broken right across. Work was started at once on the new parts to replace these. The new cylinder, weighing approximately 8,000 lbs., was cast Thursday night, Sept. 4, and was machined, tested and ready for installation by Friday morning, Sept. 12. A new piston, piston rod, upper and lower cylinder heads and connecting rod strap were made and finished in the interval, and on Sunday, Sept. 14, at 9:30 p. m., or 16½ days after her arrival, the America left Manitowoc for Escanaba to load ore for Lake Erie ports.

During the enforced lay-up of the America opportunity was taken to rebore the low-pressure cylinder and fit new rings to its piston.

These repairs, made in remarkably good time by the Manitowoc company, were under the supervision of E. V. Barry, chief engineer for the North American Steamship Co., and T. C. Warkman, representing the underwriters.

Novel Use for Floating Dry Dock

The accompanying photograph indicates the novel use to which a floating dry dock may sometimes be put. This brick building was moved in one of the sections of the floating dry dock belonging to the Manitowoc Shipbuilding & Dry Dock Co., Manitowoc, Wis. The building was moved for several blocks without disturbing a brick or even making it necessary to remove any of the furniture.



NOVEL SERVICE FOR A FLOATING DRY DOCK

Byerlyte Deck Floors

Ship owners generally are paying considerable attention to the new composition Byerlyte for deck flooring, which has been adopted by some lake owners for flooring in cabins and on freight decks, owing to its many excellent properties for use aboard ship. The distinctive features of Byerlyte deck floors are:

They can be laid over old surface as well as on a new base and will adhere to steel decks and joint up perfectly to angle iron or partitions. Being absolutely impervious to water or air prevent and retards corrosion or rust of iron or steel decks.

They are slightly resilient and easy under foot, having a delightfully smooth tread, very similar to linoleum, adding greatly to the comfort and efficiency of those who use them and are positively noiseless under foot and wheel. They also make an ideal surface over which to lay rugs and mats.

Iron-wheeled trucks roll over these floors as noiseless as if they were rubber-tired, an item of importance where noise of trucking, freight or baggage is objectionable.

They will not grind under either light or heavy trucking, and will withstand such traffic and wear as is incident to handling baggage and freight, and the more wear they are subjected to, the more dense and durable they become; in fact, they are practically indestructible as far as wear is concerned.

They are made up of varying degrees of hardness, depending upon conditions and traffic they are expected to carry with sufficient elasticity to take care of vibration, expansion, and contraction as well as any tortion motion, sudden shock, stress or strain they may be subjected to.

These floors are not only wear-proof and water-proof, but acid and fire-proof. They are non-conductors of electrolysis as well as heat and cold and are cooler in the summer and warmer in the winter than any other floor.

They are of a sheet or monolithic type, with no open seams or joints; insects cannot find harbor in them and vermin cannot gnaw them. They are easily cleaned by mop or by flushing, and when dry, are perfectly clean and odorless, as they are non-absorbent.

Atikokan's Accident

The accompanying photographs illustrate the rather singular adventure of the whaleback steamer Atikokan. Her steering gear became disabled and she ran ashore at Marine City, St. Clair river, demolishing some buildings belonging to the Pesha Art Co.

Torpedo Destroyer Melville

The destroyer tender Melville, which the New York Ship Building Co., Camden, N. J., is building for the navy department at a cost of $1,310,000, will be the second of its kind in the navy department, the other being the Dixie, which was purchased at the time of the Spanish war and converted into a tender. The Melville is designed to serve as a general supply and repair ship for a flotilla of 15 destroyers, and provision has been made for a flotilla commander so that the tender will ordinarily serve as the flagship of the flotilla. The vessel will have a capacity for a considerable quantity of stores and spare parts for the destroyers as well as provision and other supplies for the crews of these smaller vessels, thus enabling the destroyers to be encumbered as little as possible with weights not strictly required for offensive operations. In addition the tender will carry a large reserve supply of torpedoes and ammunition for the use of the destroyers and will have a fully equipped repair shop, including a small foundry, so that full advantage can be taken of the qualities of the destroyers without reference to the vicinity of a base for supplies and repairs. While the vessel is not intended to undertake offensive operations on her own account she will be armed with eight 8-in. guns for her own defense.

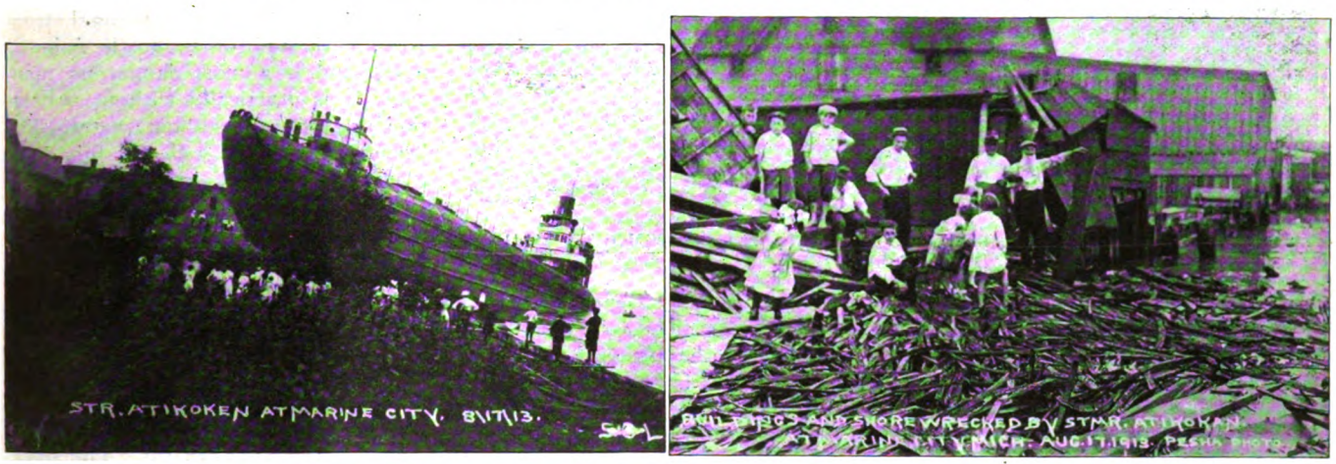
Obituary

Thomas Walton, widely known among naval architects as the author of "Know Your Own Ship" and other standard works on naval architecture, died from heart failure last month. He was born at Newcastle-on-Tyne, and began his career as a naval architect with Dobson & Sons, shipbuilders, Newcastle. In 1892 he was appointed to an important position on the staff of Ramage & Ferguson, Leith. Later he took up lecturing on naval architecture at the Leith School of Navigation, and was so successful that he was induced to embody his views in book form. Since 1899 Mr. Walton has been ship surveyor to the Board of Trade. He was 44 years old.

Capt. John C. Dow, of the United States coast and geodetic survey, died at sea, Aug. 24, while en route from Honolulu to San Francisco. He had followed the sea for more than 40 years. In 1898 he enlisted in the United States navy and at the close of the Spanish war was transferred to the geodetic survey as a nautical expert.

Byron W. Parker, president and general manager of the White Star Line, Detroit, died in his home in that city on Sept. 18 as the result of a nervous breakdown which he suffered five months ago. Mr. Parker was sixty years old and had been identified with lake trade since his early manhood.

Charles H. Starke, president of the Milwaukee Bridge Co., and widely

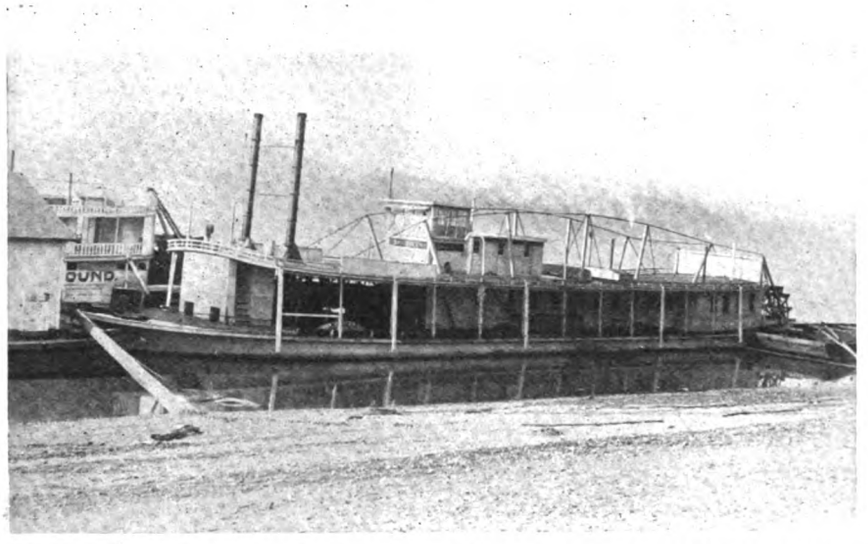


PARTING OF THE WHALEBACK STEAMER ATIKOKAN'S WHEEL CHAINS AND THE RESULTS THEREOF

known along the Great Lakes as a dredging and dock contractor, died Sept. 6 at his country home in Pewaukee at the age of 79 years.

New River Steamer

The steamer Bay Queen, running in the daily package service between Huntington and Portsmouth on the Ohio river, is 147 ft. long, 28 ft. beam and 4 ft. deep. In light condition she draws only 12 in. of water. She is equipped with 2-h. p. engines, 10 x 48 in., and two boilers, 34 in. diameter and 20 ft. long, allowed 190 lbs. steam pressure. She was completed in December of last year and is said to be the lightest business boat on inland waters. The Bay Queen is owned by William Bay, Ironton, O.



STEAMER BAY QUEEN OF THE HUNTINGTON AND PORTSMOUTH DAILY PACKET SERVICE

Items of General Interest

In anticipation of the abandonment of the New York navy yard, Secretary Daniels is now examining other sites. He recently looked over a site of 300 acres at Communipaw, N. J.

The Fore River Shipbuilding Co., Quincy, Mass., launched the submarine torpedo boat K1 on Sept. 3, one of the nine submarines building at that yard for the Navy department by the Electric Boat Co.

The new steamer Santa Cecilie, the fourth building at Cramp's, Philadelphia, for W. R. Grace & Co., was launched on Sept. 15. The new vessel is 420 ft. long, 54 ft. beam and 36 ft. deep, and is intended for service through the Panama canal.

The schooner George W. Wells, the first six-master ever built, was lost in the hurricane off the Virginia coast last month. This makes the third of this type of vessel to be lost in heavy weather, and they must therefore be a most unwieldy craft.

The Navy Board has recommended to Secretary Daniels of the Navy Department the reopening of the Pensacola naval station with the construction of a mammoth dry dock and repair facilities. The board feels that the navy yards at New York and Boston will probably have to be abandoned eventually as a result of the demands of commerce for the space which they occupy.

The Sam Smalley General Co., Bay City, Mich., recently sold two 25 H. P. engines to the United States government for use in the lighthouse service on Lake Superior. They will run on kerosene and are equipped with a mechanical ignition system. These engines mark an innovation for the Bay City company.

The Maryland Dredging & Contracting Co., Baltimore, Md., were the lowest bidders for dredging in St. James river, near City Point, Va. The other bidders were the Coastwise Dredging Co., Norfolk, Va., P. Sanford Ross, Inc., Jersey City, N. J., and Norfolk Dredging Co., Norfolk, Va.

Secretary Daniels of the navy department, has rejected all armor plate bids for battleship No. 39, and has announced that he is going to invite foreign competition. What the secretary hopes to gain by this proceeding is not quite clear, as foreign countries pay more for armor plate than does the United States.

The Florida & East Coast Railroad Co. is contemplating establishing an open sea ferry service from Key West to Havana and has the matter up with some of the eastern shipyards. The dimensions of the boats are given as 400 ft. long, 58 ft. beam and 24 ft. deep, with capacity for 36 passenger cars. Should this service be established a passenger boarding a train in New York would not leave his car until landed in Havana.

The Navy Department has awarded contracts for six torpedo boat destroyers to the following firms: Bath Iron Works, Bath, Me., one at $884,000; Fore River Shipbuilding Co., Quincy, Mass., one at $861,000; the New York Ship Building Co., Camden, N. J., two at $820,000 each; and Cramp's, Philadelphia, two at $881,000 each. The vessels are duplicates, 310 ft. long, 29 ft. 10 in. beam, displacing 1,090 tons at 9 ft. 3 in. draught. They are to burn oil and carry 4-in. rapid fire guns and four twin torpedo tubes.

The Lighthouse department has plans for erecting a steel lighthouse 150 ft. high with a light sufficiently bright to be seen twenty miles in clear weather on Navassa island, at the entrance to the Caribbean sea. This island is in the direct track of vessels en route to the Panama canal from New York and other north Atlantic ports, and is a most dangerous menace. It is practically without vegetation and entirely without water. The keeper of the light will certainly have a most lonely and desolate time.

William Simons & Co., Ltd., Renfrew, Glasgow, Scotland, have just received an order from the Tongkah Harbor & Tin Dredging Co. for a dredger of somewhat similar type to those furnished the company hitherto, but more powerful. The dredger now under construction is the fourth that the firm has been commissioned to build for the Tongkah Co. The operations of the Tongkah company in the past have been eminently successful, dividends at the rate of 40 per cent per annum having been paid to shareholders during the past two and one-half years, which is, we might add, going some.

The new ocean-going steam yacht Cyprus, designed by Cox & Stevens, of New York, is nearing completion at the yard of the Seattle Construction & Dry Dock Co., Seattle, Wash. The yacht is building for E. C. Jackling, of Salt Lake City, Utah, and is 230 ft. long by 28 ft. beam, drawing 12½ ft. of water. She is of the double deck type, her plating being carried up to the awning deck. The propelling machinery consists of twin-screw, reciprocating engines burning fuel oil under Babcock & Wilcox boilers. She has sufficient power to maintain a sea speed of 16 knots and at moderate speed has a cruising radius of 4,000 knots. The yacht has three large saloons, eleven staterooms and six bathrooms.

Commerce of Lake Superior

The commerce of Lake Superior as measured by the canals at Sault Ste. Marie reached 11,489,442 net tons, being lower than the movements for June and July and only slightly in excess of that for May, due, of course, to the lesser movement of ore owing to the strike on the dock. The movement to Sept. 1 totals 49,162,929 tons as against 41,484,926 tons for the corresponding period last year, an increase of 7,678,003 tons. Following is the summary:

	To Sept. 1, 1912.	To Sept. 1, 1913.
EAST BOUND.		
Copper, net tons	60,772	65,931
Grain other than wheat, bushels	25,046,811	55,241,355
Building stone, net tons	2,282	5,973
Flour, barrels	4,029,959	5,315,495
Iron ore, net tons	27,749,944	30,782,186
Pig iron, net tons	11,974	18,348
Lumber, M. ft. B. M.	387,691	359,491
Wheat, bushels	60,866,933	72,096,467
Unclassified freight, net tons	128,196	267,802
Passengers, number	25,264	31,288
WEST BOUND.		
Coal, anthracite, net tons	926,926	1,809 401
Coal, bituminous, net tons	8,063,094	10,553 201
Flour, barrels	.....	763
Grain, bushels	100	400
Mfctd. iron, net tons	366,989	219,921
Iron ore, net tons	3,188	32,376
Salt, barrels	405,742	448,272
Unclassified freight, net tons	748,628	723,991
Passengers, number	27,533	34,276
SUMMARY OF TOTAL MOVEMENT.		
East bound, net tons	31,315,627	35,656,964
West bound, net tons	10,169.299	13,505,965
	41,484,926	49,162.929
Vessel passages	13,330	14,290
Net registered tonnage	32,896,057	35,074,194

Iron Ore Shipments

August ore shipments totalled 7,677,601 gross tons, a decrease of 82,647 tons from the movement of August, 1912, and a decrease of 526,815 gross tons from the July, 1913, movement. This slump, of course, is at Superior, Wis., where the Allouez dock was working throughout the whole month at practically 50 per cent efficiency owing to the strike. Shipments from that port during the month aggregated nearly 1,000,000 tons less than normal, and some hindrance occurred also at the Missabe dock at Duluth. Had it not been for this the August movement would undoubtedly have exceeded the July movement. The movement to September 1 totals 32,007,072 tons as against 29,051,152 tons during the corresponding period of 1912, an increase of 2,955,920 tons. Following are the comparative figures:

Port.	August, 1912.	August, 1913.
Escanaba	761,717	964,288
Marquette	570 586	598,861
Ashland	761,539	809,597
Superior	2,397,535	1,512,425
Duluth	1,690.650	1,957,239
Two Harbors	1,578,221	1 835,191
Total	7,760,248	7,677,601
1913 decrease		82,647

Port.	To Sept. 1, 1912.	To Sept. 1, 1913.
Escanaba	3,240,011	3,623,632
Marquette	2.001 400	2,155,363
Ashland	2,865,397	3,073,628
Superior	9,066,190	8,585,838
Duluth	6,076,452	7,891,903
Two Harbors	5,801 702	6 676,708
Total	29,051,152	32,007,072
1913 increase		2,955,920

Lake Erie Ore Receipts

Out of a total movement of 7,677,601 gross tons of Lake Superior iron ore during August, 6,075,726 gross tons came to Lake Erie ports, distributed as follows:

Port.	Gross tons.
Buffalo	876,409
Erie	98,706
Conneaut	1,184,390
Ashtabula	1 291,293
Fairport	358,718
Cleveland	1,404,946
Lorain	578,230
Huron	98 500
Sandusky	.....
Toledo	150,337
Detroit	34,197
	6,075,726

Sold to Russian Volunteer Fleet

The steamship Novgorod was recently sold by Messrs. Swan, Hunter & Wigham Richardson to the Russian Volunteer Fleet Association. The Novgorod is 402 ft. long, 50 ft. 6 in. broad and has a molded depth of 30 ft. 5 in. The engines of the well-known Neptune type of Swan, Hunter & Wigham Richardson, are triple-expansion and are designed to drive the ship when fully loaded with 7,600 tons deadweight at a speed of 11¼ knots per hour. The engine room's outfit and provision for auxiliary machinery are unusually ample. The Novgorod is built to the highest class of Lloyd's classification and Odessa is her port of registry.

In addition to carrying cargo the Novgorod has accommodation for 30 first-class passengers and over 1,000 emigrants. The latter are quartered in the main 'tween decks and part of the poop, where a fully equipped hospital is also provided. The first-class passengers have their rooms in the bridge house amidships. The adjoining dining saloon is elegantly paneled and furnished in polished oak. The captain, officers and engineers have commodious cabins on the bridge deck. Rooms are also provided for the ship's doctor, a paymaster, apprentices and a stewardess. The seamen and firemen are quartered in the forecastle on the upper deck. Every attention has been paid to the commissariat department, seeing that in addition to the saloon kitchen there is a galley in the forecastle for the crew and also two separate galleys for the emigrants. The ship has electric lighting and steam heating throughout.

Accidents on the Lakes

The Year Has Been Marked With Few Accidents and Underwriters Should Have a Profitable Year

HEREWITH is published a tabulation of accidents that have occurred on the lakes since the beginning of the year. The year has not been marked with anything serious, either in property or in the number of lives lost. The total losses so far have been the steamer Uganda on April 18; she was cut through by ice in the Straits of Mackinaw and foundered. The barge Iron City was struck by the steamer Thomas F. Cole in the St. Clair river near Russell island and was practically cut in two on May 3. The barge Allegheny ran ashore in a heavy storm at Crisp Point, Lake Superior, on June 6 and became a total loss. The steamer E. M. Peck was destroyed by the explosion of her starboard boiler at Racine, Wis., on June 11 and she is a constructive total loss. Seven members of the crew were killed. The barge Annabel Wilson foundered in Lake Erie off Dunkirk on July 12, drowning two members of the crew. The barge Crete was in collision with the steamer F. B. Squire in the St. Clair ship canal and was sunk, becoming a constructive total loss. The barge Donaldson filled with water and sank in the outer harbor at Cleveland, on Aug. 17.

The first accident of the year happened to the steamer Saxona when on Jan. 4 she struck the wreck of the

steamer W. C. Richardson outside of Buffalo harbor, damaging about twenty of her plates. On April 27 the steamer J. K. Dimmick was struck by the steamer W. H. Wolf outside of Buffalo harbor, crushing in her stern, the damage amounting to approximately $10,000. The steamer W. S. Mack had a succession of accidents on her down trip on May 2, finally winding up in the dry dock at Ashtabula. The steamer D. B. Meacham struck in the Livingstone canal, making necessary the removal of fifteen plates off the port bilge. The Jesse Spalding was in collision with the steamer William P. Snyder Jr. on June 15, damaging her port bow and upper works. After temporary repairs were made at the Sault, she left for Ashtabula, where it was found that eleven of her plates had been damaged. The rig on the coal dock of the Pennsylvania Coal & Supply Co. at Milwaukee fell on the steamer I. W. Nicholas on June 16, doing considerable damage to her upper works. She was taken to Toledo for repairs. The revenue cutter Tuscarora ran ashore in a heavy fog on Vidal shoal on a rocky bottom and was badly damaged. The steamer Lewiston was in collision with the steamer Louis R. Davidson in the St. Clair river and was damaged to the extent of $10,000. The steamer Charles Weston ran ashore near Two Harbors in a dense fog on June 27 and spent 24 days in dry dock. Her bottom damage was quite serious. On July 14 the steamer Kenora hit the dock at Montreal and damaged fourteen plates. The steamers John B. Cowle and James Laughlin were in collision off Presque Isle, Lake Superior, on July 17, and both vessels sustained damage amounting to about $10,000 each. The steamer Lehigh had a trip filled with vicissitudes beginning Aug. 2 when she carried away two gates of Lock 23 of the Welland canal, closing the canal to navigation for twenty-four hours. She was later struck by the schooner Augusta and sent to the bottom. She was floated on Aug. 8 and went to Montreal, but stranded on the 15th at Coteau. She was docked for repairs at Ashtabula on Aug. 28 when it was discovered that forty-three plates were damaged. The steamer W. S. Mack struck on Duck island, Lake Huron, on Aug. 7 and shook herself up quite badly. She was repaired at Ecorse. The steamer Hamiltonian was in collision with the steamer Hamonic on Aug. 20 and sustained considerable hull damage. On Sept. 10 the steamer Northern Queen stranded on Rock of Ages, Lake Superior, and was very badly damaged, making necessary the removal of seventy plates.

Quite a number of vessels encountered obstructions in the Livingstone channel during the season, sustaining in certain cases severe bottom damage.

The steamers Agassiz, Ishpeming, Verona, Joseph Wood, Elba, LaBelle and Crete reported that, while being moored in the Sault canal above the Canadian lock, they were put upon the bottom by the practice of flooding the vessels out. As far as known, however, no damage of any consequence has resulted from this maneuver.

The tabulation of accidents is as follows:

Date	Name of Vessel.	Nature of Accident.	Place.
Jan. 4	Str. Saxona	Ran on submerged obstruction and broke propeller wheel; then on wreck of Str. Richardson; 15 or 20 bottom plates badly damaged. Repairs estimated at $15,000	Near Waverly Shoal, Lake Erie
Jan. 10	Str. Spokane	Fire destroyed her after cabins	Port Huron.
Feb. 1	Str. J. C. Wallace	Torn from her moorings; hawser parted and chain broken	Buffalo.
Feb. 3	Str. J. G. Butler Jr.	Fire in one of her bunkers; damage slight	Fort William.
Feb. 13	C. F. International	Rudder disabled while breaking through ice	St. Clair river.
Mar. 24	Str. City of Montreal	Damaged by fire	Montreal.
Mar. 25	Str. Presque Isle	Broke adrift in flood; released after three days' work on her by Great Lakes Towing Co.	Lorain, O.
Mar. 25	Str. J. B. Eads	Broke adrift in flood; two bow plates damaged; dock April 12 for repairs to her shoe and rudder	Lorain, O.
Mar. 25	Tug Pierce	Slightly damaged in flood	Lorain, O.
Mar. 25	Tug Excelsior	Slightly damaged in flood	Lorain, O.
Mar. 26	Str. Andaste	Torn from her moorings by flood and stranded; released on Mar. 27 uninjured	Cleveland, O.
Mar. 26	Str. W. H. Mack	Torn from her moorings by flood; eight plates damaged; about a week to make repairs	Cleveland, O.
.....	Sch. C. C. Barnes	Ran on a dock her entire length near Cincinnati slip during flood. Damage slight	Cleveland, O.
.....	Bge. Donaldson	Damaged by flood	Cleveland, O.
.....	Str. E. L. Fisher	Ran aground near Central viaduct in flood	Cleveland, O.
.....	Tug Alert	Broke adrift in flood; had to dock for repairs	Cleveland, O.
.....	Str. Orion	Damaged by fire	Green Bay, Wis.
Mar. 28	Str. J. J. Boland	While being towed out, struck pier; damage estimated at $2,250	Buffalo, N. Y.
Apr. ..	Str. Regina	Broke adrift and damaged her rudder stock	Sarnia, Ont.
Apr. 18	Str. Uganda	Cut through by ice and foundered; crew taken off by Str. Donaldson; total loss; not insured	Near White Shoals, Straits of Mackinac.
Apr. 19	Str. W. J Olcott	Steering gear became disabled while she was entering canal and she struck the south pier with her starboard bow, denting some plates and damaging pier. Docked for repairs later	Duluth ship canal.
Apr. 19	Str. Frank H. Peavey	Collided with a pile driver, damaging it	Buffalo.
Apr. 19	Str. Geo. F. Baker	Rudder carried away while attempting to pass through Eight St. draw	Manitowoc, Wis.
Apr. 21	Str. Joshua W. Rhodes	Grounded while entering harbor	Waukegan, Ill.
Apr. 21	Str. Maryland	Damaged in collision with Str. S. R. Parent while tied up in ice; coaming of cabin damaged and hull dented	Straits of Mackinac.
Apr. 21	Str. H. H. Brown	After having left Duluth about two hours, engine became disabled and she had to be towed back	Lake Superior.
Apr. ..	Str. J. Q. Riddle	While leaving grain elevator, all buckets knocked off her wheel in ice; two new blades put on and she proceeded	Fort William.
Apr. ..	Str. Kearsarge	Bows crushed in by ice and forward peak filled with water. Grain cargo lightered and temporarily repaired at Mackinaw	Mackinaw.
Apr. ..	Str. W. D. Reis	All buckets stripped off her wheel by ice	
Apr. 22	Str. A. E. Stewart	Collided with Str. Caldera; struck on port anchor, breaking hawse pipe and bending pipe plate. Temporarily repaired at Soo	Whitefish bay.
Apr. 22	Str. Caldera	Collided with Str. A. E. Stewart; plate dented abreast No. 4 hatch	Whitefish bay.
Apr. ..	Str. Meaford	Buckets stripped off her wheel; towed to Fort William	Whitefish bay.
Apr. 23	Str. Kenora	Collided with Str. Thos. Walters; hawse pipe broken and one plate cracked. Str. Walters not injured	Whitefish bay.
Apr. 23	Str. W. E. Fitzgerald	Collided with Str. J. K. Dimmick while working through ice, damaging several plates and frames	Whitefish bay.
Apr. 23	Str. J. K. Dimmick	Collided with Str. W. E. Fitzgerald, denting one plate	Whitefish bay.
Apr. 23	Str. Ishpeming	Stranded in hazy weather; not damaged	Lake Erie, near Cedar Point.
Apr. 23	Str. L. C. Smith	Two plates dented in striking Str. L. R. Davidson; boats bumped in passing	Whitefish bay.
Apr. 25	Str. A. D. MacTier	Thrust against lock wall by current; bow plates badly damaged	Soulanges canal.
Apr. ..	Str. W. B. Davock	Hit Strs. Spokane and Hartwell; damage small	Soo.
Apr. 27	Str. D. B. Meacham	Two plates and stanchions bent on port quarter	Whitefish bay.
Apr. 27	Str. D. M. Whitney	Collided with Str. W. P. Snyder; slightly damaged	

Date	Name of Vessel.	Nature of Accident.	Place.
Apr. 27	Str. J. K. Dimmick	Hit by Str. W. H. Wolf; rudder smashed, stern crushed in; towed in for repairs, which approximated $10,000	Outer harbor, Buffalo.
Apr. ..	Str. Eugene Zimmerman	Damaged by ice	Welland canal.
Apr. 27	Str. A. E. Ames	Carried one gate of lock No. 5	
Apr. 27	Str. L. P. Robinson	Struck on west bank of channel and sustained heavy bottom damage; 17 plates damaged, docked at Ogdensburg	Lachine Lake.
Apr. 28	Str. F. P. Jones	Grounded; bottom damaged	Lachine Lake.
Apr. 28	Str. Selwyn Eddy	While making landing, caught by current and struck northwest pier, bending two plates and six frames. Damage estimated at $1,200	Canadian canal, Sault.
Apr. 29	Str. Wm. H. Mack	Stem caught bank, causing her to sheer and struck Bge. Constitution lying at dock. Three frames bent and plates between frames damaged	Calumet river, Chicago.
Apr. 29	Bge. Constitution	Struck by Str. Wm. H. Mack; damaged on port side	Calumet river, Chicago.
Apr. 29	Str. Mauch Chunk	Ran ashore while navigating through thick floating ice and fog; released on April 30; reloaded lightered cargo	Seneca Shoals, Lake Erie.
Apr. ..	Str. W. H. Truesdale	Slightly damaged by striking a bridge	Milwaukee.
Apr. ..	Str. Onoko	Slightly damaged by striking a bridge	Milwaukee.
May 1	Bge. Sagamore	Struck, down-bound, in tow of Str. Victory; released on May 2, reloaded 800 lightered tons of cargo; docked at Toledo on May 6; eight damaged plates	Livingstone channel.
May 1	Str. Arcturus	Encountered heavy ice shortly after leaving Whitefish Point and sustained damage to two plates and six or eight frames	Lake Superior.
May 1	Str. Isaac M. Scott	Tow line parted and she struck Str. Chemung, damaging four plates	Buffalo river.
May 1	Str. Chemung	Hit by Str. Isaac M. Scott. Slightly damaged	Buffalo river.
May 1	Str. H. M. Hanna Jr.	Steering gear disabled and she hit dock; stern twisted and forepeak filled with water; temporarily repaired at Port Huron; docked at Lorain on May 23; repairs estimated at $1,000; dock damage, $500	Point Edward, Ont.
May 2	Str. Wm. Livingstone	While lying at dock, struck by Str. Martin Mullen, damaging one plate, two deadlights and two bulkheads	Duluth, Minn.
May 2	Str. W. G. Pollock	While lying at anchor, hit by Str. Chas. Hubbard; bows badly damaged, stem broken; repaired at Superior, at a cost of about $10,000	Sault river.
May 2	Str. Chas. Hubbard	Struck Str. W. G. Pollock; slightly damaged	Soo river.
May 2	Str. Tacoma	Hit by Str. C. W. Kotcher; slightly damaged	Cleveland.
May 2	Str. W. S. Mack	Ran ashore; released by tug on May 3 and while coming down abreast of Russell island, was hit by Str. Turret Crown and wheel, shoe and rudder carried away, also number of plates damaged. Towed down by two tugs to Ashtabula where she docked on May 16	Off Whitefish Point.
May 2	Str. Turret Crown	Collided with Str. W. S. Mack; number of plates punctured; break in side temporarily repaired at Soo; repairs completed on May 8; reloaded lightered grain	Near Russell island, St. Clair river.
May 2	L. H. Tender Crocus	Hit by U. S. Dredge Burton; hit amidships, Burton's bow penetrating Crocus' boiler-room. Docked at Toledo	Toledo harbor.
May 3	Bge. Iron City	Sunk by Str. Thos. F. Cole, practically cut in two. (In tow of Str. Alaska).	St. Clair river near Russell island.
May 3	Str. J. B. Lozen	Also in tow of Str. Alaska (see above item) took a sheer and hit a dock at Algonac	St. Clair river.
May 3	Str. Pathfinder	Ran on bank; released on May 7, leaking; docked at Cleveland on May 8, left dry dock on May 26; number of plates damaged	Livingstone channel.
May 3	Bge. Constitution	In tow of Str. Pathfinder and also ran on; released on May 5 after lightering 1,000 tons ore; docked at Toledo; fourteen damaged plates	Livingstone channel.
May 4	Str. Indus	Ran ashore in fog; Nos. 2 and 3 tanks punctured; docked at Ecorse on May 8; repairs completed on May 17; 20 damaged plates	Scott's Pt., Straits of Mackinaw
May ..	Str. Fleetwood	Ran ashore; released on May 8; temporarily repaired	Near Detour Point.
May ..	Str. Cherokee	Ran aground; released on May 7 and went to Alpena	Sturgeon Point.
May ..	Bge. N. C. Holland	In tow of Str. Cherokee and also ran aground; released	Sturgeon Point.
May 5	Str. Niagara	While tied to dock above the locks, was hit by Str. M. A. Bradley, anchor of Bradley making hole in Niagara's side; also one plate dented	Soo.
May ..	Bge. Peshtigo	Forefoot broken off in ice	
May 6	Str. Lakewood	Broke eccentric rod	Lake Superior.
May 7	Str. Follette	Engines became disabled and she returned to Sault for repairs; while making dock after being repaired, sustained further damage by twisting her stem, ramming bow against pier; left Soo on May 8, repaired	Lake Superior, near Whitefish.
May 8	Str. Unadilla	Ran on wreck of Str. Richardson; released and towed behind breakwall where she sank. (In tow of Str. Robert C. Wente).	Buffalo.
May 9	Str. W. E. Reis	Struck and damaged unloading rig on Upson Nut Co.'s dock	Cleveland.
May 11	Str. Brower	Lost her shoe and rudder and was forced to anchor; towed to Superior dry dock	St. Mary's river.
May 13	Str. Masaba	Collided with Str. Sequin; bow stove in above water line; eight plates damaged; repaired at Ashtabula	Welland canal.
May 14	Str. D. B. Meacham	Collided at coal dock, with Str. Huron; one plate bent and chock broken	Cleveland.
May 14	Str. Verona	Collided with Str. Geo. N. Orr; slightly damaged	Milwaukee, Wis.
May 14	Str. Geo. N. Orr	Collided with Str. Verona; one hull plate and several bulwark plates damaged	Milwaukee, Wis.
May 14	Str. Milinokett	Collided at Sixteenth street dock with Str. Amasa Stone; slightly damaged on starboard side	Milwaukee, Wis.
May 14	Str. S. M. Clement	Rammed by Str. F. G. Hartwell in storm; port quarter stove in, deck plates bent and upper deck damaged	Ship canal, Duluth.
May 14	Str. F. G. Hartwell	Hit by Str. S. M. Clement; two bow plates sprung, three frames bent; temporarily repaired	Ship canal, Duluth.
May 14	Str. Joseph Wood	Collided with Str. Thomas Shaughnessy; plates and stanchions bent, gunwale and deck damaged. Repair bill about $700	Allouez bay.
May ..	Str. Burlington	Collided with a scow and twisted her rudder stock	Chicago harbor.
May ..	Str. Sierra	Lost her wheel	
May 15	Str. F. L. Robbins	Stranded on a boulder; bottom damaged, leaked badly	Sandusky bay.
May 15	Str. Ward Ames	While working her way into harbor, broke all buckets off her wheel	Duluth harbor.
May 16	Str. Shenango	Forced against the bank by current while at coal dock; one plate damaged	West Duluth.
May 16	Str. Wainwright	While unloading, was struck by Str. John J. Boland; cable parted, stem bent and several plates damaged	Buffalo.
May 16	Str. John J. Boland	Collided with Str. Wainwright; bulwarks on stern and top rail bent, also gunwale bar and top of sheer plate on main deck damaged	Buffalo.
May 16	Str. Norwalk	Ran aground while shifting from one dock to another	St. Louis bay.
May ..	Bge. Maia	While coming out of Conneaut in tow of tugs, hit pier and damaged three plates	Conneaut, Lake Erie.
May 17	Str. Milinokett	Collided with Str. Durston; both boats slightly damaged	Milwaukee harbor.

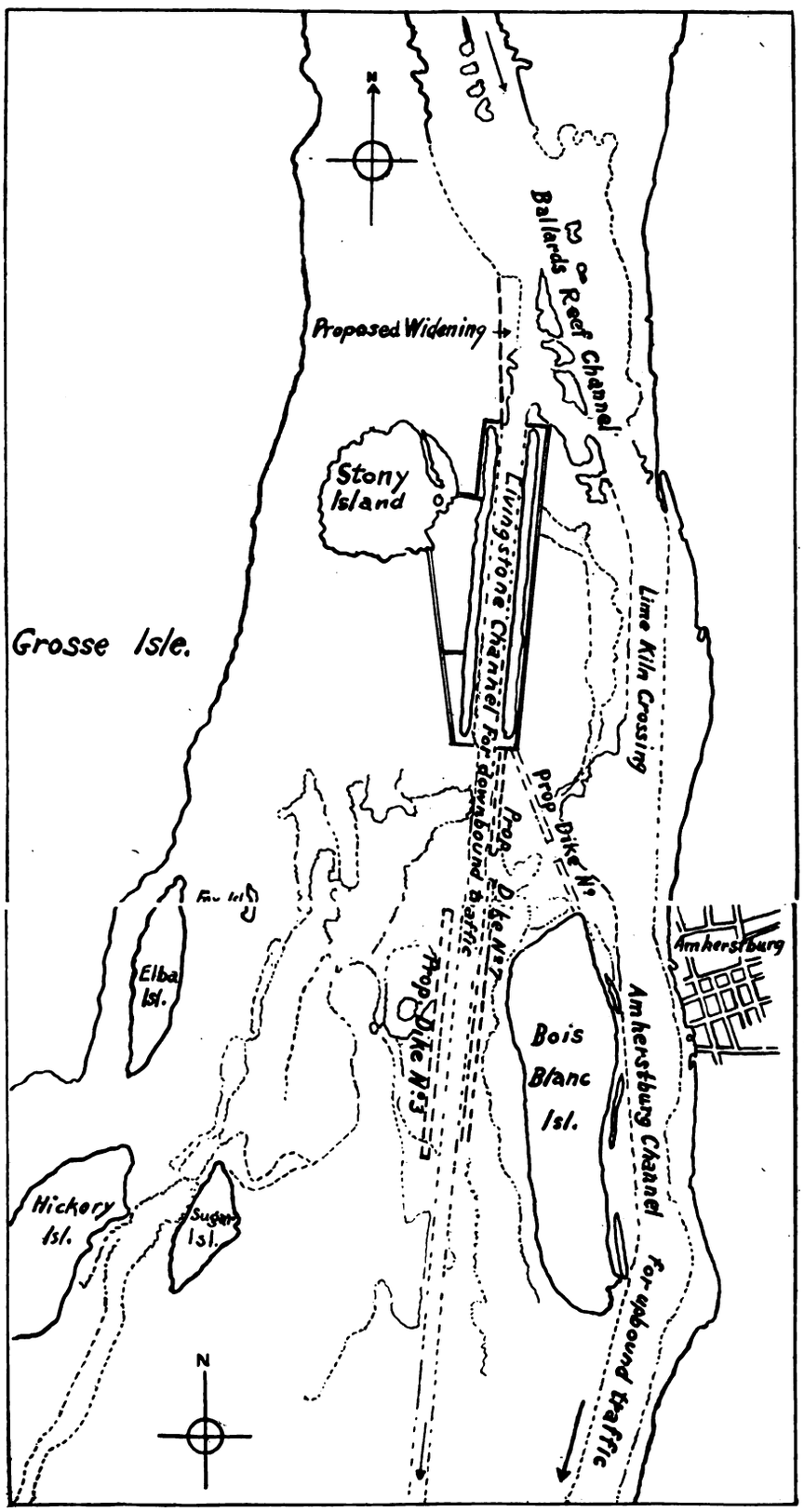
Date—Name of Vessel.	Nature of Accident.	Place.
May 18 Str. Lucius W. Robinson.....	Stranded; released herself	Long Point, Lake Erie.
May 19 Str. L. C. Waldo.....	Collided with Str. City of Buffalo; one plate dented on port bow and some iron scuppers broken	Cuyahoga river, Cleveland.
May 21 Str. James Davidson.....	Engine became disabled; picked up by Str. Hoover & Mason off Presque Isle and towed to Duluth.....	Lake Huron.
May 21 Str. Gen. Garretson.....	Hit bank in fog and disabled her rudder; towed to Conneaut by tugs; lost shoe; docked at Cleveland on May 26.....	St. Clair river.
May 22 Str. E. W. Oglebay	While rounding to at Miller's coal dock, towing cable of her barge became fouled in wreckage of Str. Joliet, causing steamer and barge to collide; both boats damaged; Tyrone lost her anchor and five plates were damaged on the Oglebay.....	St. Clair river, at Port Huron.
May 22 Str. C. Russell Hubbard.....	Struck a sunken log and broke a bucket off her wheel; returned to Port Huron for repairs.....	Above Corsica Shoals, Lake Huron.
May 22 Str. C. R. Van Hise.....	Ran ashore in heavy fog; leaked; released on May 25 after jettisoning 800 tons of ore; docked at Toledo; nineteen damaged plates	Bois Blanc Island, Straits of Mackinac.
May 22 Str. J. S. Ashley.....	Hit by Str. H. B. Nye; two plates dented.....	Port Huron.
May 22 Str. Geo. W. Perkins.....	Collided with Str. Wm. Nottingham and then struck the bank and broke her quadrant; small hole punched in after end; stopped at Ecorse for repairs. Str. Nottingham slightly injured.....	Detroit river.
May 23 Str. Ontario	While going down river collided with a tug and scows, damaging one plate	Cuyahoga river, Cleveland.
May 23 Str. Harry Yates	While being towed out of port, struck east pier, damaging two plates and frames; damage estimated about $500.....	Ashtabula.
May 24 Bge. Sagamore	Struck an obstruction, damaging her bottom.....	Livingstone channel.
May 26 Str. Hurlbut W. Smith.....	Collided with Str. D. Z. Norton, damaging her stern bulwarks. Norton not damaged	Menominee river, Milwaukee.
May 26 Bge. Ed. McWilliams.....	Took a sheer while approaching American canal and crashed against south pier; port bow damaged.....	Sault canal.
May 27 Str. Joseph Wood.....	Dented one plate and two frames by striking piling of No. 6 dock; damage about $500.....	Escanaba, Mich.
May 28 S. O. Bge. No. 83.....	Struck and was damaged forward; lost part of her cargo.....	Soulanges canal.
May 28 Str. F. B. Squire.....	Wheel chains parted, stranded on south bank; released on May 30 after lightering 1,800 tons of ore; reloaded lightered cargo and not damaged	West Neebish channel.
May 29 Str. Umbria	While being towed up the river, struck Str. James Corrigan; anchor of Str. Corrigan damaged one plate below sheer strake of Umbria	Lorain, O.
May 30 Str. H. P. Bope.....	While backing out of slip, struck obstruction, damaging quadrant, steam pipe and after deck engine; towed to Superior ship yard for repairs	St. Louis river, near Duluth.
May 31 Str. Myron	Broke her shaft; towed to Duluth	Off Huron island, Lake Huron.
May 31 Str. Brazil	While entering port, struck the bank, twisting her rudder stock..	Manitowoc harbor.
June 1 Str. Strathcona	Struck abutment in approaching lock, breaking hawse pipe and damaging plates and frames. Damage estimated at $1,000.....	Soulanges canal.
June 2 Str. S. R. Kirby.....	Grounded on an obstruction; bottom damaged.....	Sandusky bay.
June 6 Str. Nyack	Hit Buffalo street bridge, damaging it beyond repair.....	Buffalo.
June . Str. Kenora	Ran ashore; released after lightering; No. 1, 2, and 3 tanks filled with water	Lachine lake.
June 6 Str. Minnetonka	Wheel chains parted and she ran aground; lightered and released on June 8	Livingstone channel.
June 6 Bge. Allegheny	Ran ashore in heavy storm; and probably total loss.....	Crisp Point, Lake Superior.
June 7 Str. Andrew Carnegie	While winding at entrance to old riverbed, hit the bank and damaged her rudder; diver made repairs.....	Cleveland.
June 10 Str. D. B. Meacham.....	Struck; 15 plates had to be taken off port bilge in repairing her; docked at Cleveland June 12; about 12 days in dry dock.....	Livingstone channel.
June 11 Str. E. M. Peck.....	Starboard boiler exploded, killing seven of crew; vessel constructive total loss	Racine.
June 11 Dredge Pocantico	Sprang leak and sank; crew rescued. Floated by Reid Wrecking Co. Sept. 9	Buffalo, near breakwall.
June 11 Str. C. W. Kotcher.....	Through error in working the engine, backed into a dock, damaging three plates and frames and also damaging unloading machines which she struck	Conneaut harbor.
June 14 Bge. Sagamore	(In tow of Str. Pathfinder). Cable became tangled in her rudder and she ran on a sandy shoal; released and proceeded after making repairs to her rudder.....	St. Clair Flats canal, near Star island.
June 15 Str. Geo. Peavey	Hit by upper West Third street bridge and part of her deck taken off	Cleveland.
June 15 Str. Lloyd Porter	Four gates carried away by steamer; misunderstanding of signals cause of accident; bow damaged; ordered to Picton for repairs.	Welland canal.
June 15 Str. Jesse Spalding	Collided with Str. W. P. Snyder Jr.; port bow damaged, hawse pipe broken and upper works badly damaged; temporarily repaired at Soo and left on June 18; docked at Ashtabula on June 21; eleven damaged plates; about two weeks in dry dock.	Lake Superior.
June 15 Str. W. P. Snyder Jr.....	Collided with Str. Jesse Spalding; port bow damaged above water line as well as number of plates and frames; repaired at Superior where she left on June 27.....	Lake Superior.
June 16 Str. I. W. Nicholas.....	Rig on Pennsylvania Coal & Supply Co.'s dock fell on deck of steamer and then into river; repairs estimated at $20,000; left Milwaukee on June 28 for Toledo for repairs.....	Milwaukee.
June 17 Str. O. M. Poe.....	While being towed out, hit channel bank stern first, putting bad twist in rudder stock	Duluth.
June 17 Str. Donnacona	Ran ashore; released on June 19 and went to Kingston; considerable bottom damage	W. Duck island, St. Lawrence river.
June .. Str. Jas. Carruthers.....	Steering gear disabled; towed to Detroit for repairs.....	Above Corsica Shoals, Lake Huron.
June 19 Rev. Cut. Tuscarora.....	Ran ashore in heavy fog on rocky bottom; pretty badly damaged; floated on June 21 and towed to Detour.....	Vidal Shoals, Lake Huron.
June 19 Str. Clarence A. Black.....	Ran ashore in heavy fog; released on June 20, uninjured.....	Gros Grop Pt., Lake Superior.
June .. Str. Joshua W. Rhodes.....	Tore up part of Kemp's coal dock but sustained little damage....	St. Clair river.
June .. Bge. Chattanooga	Ran aground at lower entrance.....	St. Clair Flats canal.
June 19 Str. Champlain	Collided with Bge. Corliss, striking her starboard anchor; bow plate and frame damaged	Sault canal.
June 20 Str. Choctaw	Ran ashore in heavy fog; released on June 21; lost anchor and bottom damaged; docked at Lorain on June 25.....	Whitefish bay.
June 21 Str. Frank H. Peavey.....	Collided with Str. Corsica and tow; both steamers only slightly damaged	St. Clair river.
June 21 Str. L. C. Waldo.....	While lying at dock was struck by Str. Milinokett on port quarter, damaging bulwarks and bending braces	Cleveland.
June 21 Str. Fairmount	Struck obstruction and sprang a leak; stern and part of cargo damaged; repaired at Ashtabula.....	Welland canal.
June 22 Str. America	While passing out of slip, stern struck obstruction, breaking all buckets off her wheel.....	Manitowoc.
June 22 Bge. Constitution	Caught in wreckage on bottom of river, damaging towing chock, pipe railing, etc.....	St. Clair river.
June 23 Str. Wm. G. Mather.....	Struck obstruction, damaging her bottom for practically whole length of the ship.....	Lake Superior near Presque Isle

Date	Name of Vessel.	Nature of Accident.	Place.
June 24	Str. Lewiston	Collided with Str. Louis R. Davidson when vessels were passing each other; damage to Lewiston estimated at $10,000	St. Clair river.
June 24	Str. L. R. Davidson	Collided with Str. Lewiston; two plates dented	St. Clair river.
June 24	Str. W. A. Rogers	Ran aground owing to break in her quadrant; not damaged	St. Marys river, Round island.
June ..	Str. Coralia	Ran ashore on rocky bottom; released on June 28; No. 1 tank punctured and she leaked	Crab island, near Detour.
June 26	Str. J. T. Kopp	Ran aground in fog; released on June 27; bottom damaged	Entrance to Duluth harbor.
June ..	Str. Sacramento	Air pump disabled; returned to Duluth for repairs	Lake Superior.
June ..	Str. E. L. Fisher	Mate's quarters badly damaged by fire	Cleveland.
June ..	Str. Keywest	Struck and damaged her forepeak; leaked	Lachine lake.
June ..	Str. Acadian	Struck; considerably damaged; docked at Kingston	Welland canal.
June 27	Str. J. H. Sheadle	Ran ashore in fog; released on June 27, uninjured	Near Whitefish Pt., Lake Superior.
June ..	Str. Geo. Stephenson	Struck, upbound light	Straits of Mackinaw.
June ..	Str. Henry Cort	Lost number of buckets and had to drop consort and return to Sault for repairs	Off Whitefish Pt., Lake Superior.
June 27	Str. Chas. Weston	Ran ashore in dense fog; released on June 28 by tug; forefoot badly damaged, including 27 plates; docked at Superior; 24 days in dry dock	Burlington bay, near Two Harbors.
June 28	Str. Maruba	Ran aground; released after lightering 300 tons of ore	Toledo.
June 28	Str. L. C. Waldo	While landing, rubbed against concrete dock, damaging huil plating, some frames and stringers	Superior.
June 29	Str. Thomas Maythan	Struck canal boat N. J. Brown, doing considerable damage	Chicago river.
June 29	Bge. Aurora	Ran aground	Portage river.
June 30	Str. Q. A. Shaw	While at dock, loading, was struck by Str. Douglass Houghton, damaging after tow chock, two bulwark plates, and rail bent	Ashland, Wis.
July 2	Str. L. C. Waldo	Took a sheer and rubbed against east bank of channel	Livingstone channel.
July 3	Str. Wm. H. Mack	Collided with Jefferson street bridge, damaging bulwark plate; damage estimated at $500	Cleveland, O.
July 4	Str. Canopus	Stranded; lightered and released on July 6	Hay lake.
July 4	Str. J. A. McKee	Struck Str. LaBelle, damaging plate on starboard bow	Canadian Soo.
July 4	Str. Henry B. Smith	Stranded when steering engine became diasbled; released on July 7th	West Neebish channel.
July 4	Str. A. E. Ames	Ran ashore; released on July 9; No. 1 and 2 tanks punctured, six plates damaged; docked at Ashtabula July 12	Salmon Pt., Lake Ontario.
July 4	Tug Mosher	Crushed against Wells street bridge and badly damaged; pilot house demolished	Chicago.
July .	Str. Ungava	Struck; bottom damaged; docked at Kingston	St. Lawrence river.
July 5	Str. City of the Straits	Bumped Str. Frank H. Peavey; stern of City of the Straits slightly damaged and two plates dented	
July 5	Str. F. E. House	Lost an anchor	Duluth entry.
July 5	Str. James Laughlin	Struck the bank and ran aground; released	Hay lake.
July 5	Str. Rufus P. Ranney	While passing through American canal, took a sheer to port and struck the pier, damaging her bow	Sault canal.
July 6	Str. Victory	Hit by Str. J. S. Morrow while tied up at ore dock; three plates bent, butt strap and two plates dented, mooring cable parted. Morrow not damaged	Cleveland.
July 6	Bge. Peters	Driven ashore in heavy wind; released on July 7	Crab island near Detour.
July 6	Str. Powell Stackhouse	Hit by Str. W. K. Bixby	Outer harbor, Cleveland.
July 6	Str. G. A. Tomlinson	Stern damaged by hitting gate of lock; damage estimated at $1,000	Canadian lack, Sault canal.
July 8	Str. Alpena	Grounded while leaving port; bottom damaged; temporarily repaired at Ecorse, Mich.	Sandusky.
July 11	Str. F. G. Hartwell	Ran aground in heavy weather; released, uninjured	St. Clair river, near Sarnia.
July 11	Str. S. M. Clement	Ran aground in heavy weather; released, uninjured	St. Clair river, near Sarnia.
July 12	Bge. Annabelle Wilson	Cargo shifted in heavy sea and she foundered; two lives lost	Lake Erie, off Dunkirk.
July 12	Bge. Mary McLachlan	Sank in storm, after shipping considerable water; crew rescued; raised later and taken to Buffalo	Near Long Pt., Lake Erie.
July 13	Str. R. L. Agassiz	While leaving port, grounded on mud bottom, owing to low water; not injured	Maumee river, Toledo.
July 13	Str. Pathfinder	Collided with Bge. Sagamore; bow considerably damaged	Off Ashtabula, Lake Erie.
July 13	Bge. Sagamore	Collided with Str. Pathfinder; two plates and six frames on starboard side damaged	Off Ashtabula, Lake Erie.
July 13	Str. Frank C. Ball	Hit obstruction shortly after leaving Sandusky; forward compartment stove in and leaked badly; cement patch put on at Detroit and she proceeded	Lake Erie.
July 14	Str. Calumet	Ran aground	Livingstone channel.
July 14	Str. Jesse Spalding	Collided with Str. Frank H. Peavey; two plates damaged	Cuyahoga river, Cleveland.
July ..	Str. Kenora	Hit a dock and damaged stern and forefoot; docked at Lorain on July 18; 14 plates damaged	Montreal.
July 14	Str. Ogdensburg	Hit government pier; not damaged	Milwaukee.
July 15	Str. J. W. Moore	Ran ashore in dense fog; released, uninjured	Near Whitefish Pt., Lake Superior.
July 15	Str. Cherokee	Ran into a pier and punched hole in her bow; beached for temporary repairs; later released and taken to Hancock to unload	Portage entry.
July 16	Str. Arcturus	Grounded on a boulder	Detroit river.
July 16	Str. Senator Derbyshire	Collided with Str. Calgary; slightly damaged	Welland canal.
July 17	Str. John B. Cowle	Collided with Str. James Laughlin; bow stove in, hawse pipe damaged, anchor lost; repaired at Toledo; damage estimated at $10,000	Off Presque isle, Lake Superior
July 17	Str. James Laughlin	Collided with Str. John B. Cowle; 15 plates and 20 frames damaged; repaired at Superior; damage estimated at $12,000	Off Presque isle, Lake Superior
July 17	Str. Normandie	Ran ashore; released after jettisoning part of cargo	Off Bear Pt., Lake Michigan.
July 17	Tug. Emma Bloecker	Hit by Bge. Filer and badly damaged on starboard side; plates smashed and boiler displaced several inches	Lake Michigan, near Racine.
July 17	Str. Iowa	Collided with Str. Sheboygan in fog; big gash in port bow and sank; temporarily patched and floated on July 26; docked for repairs at Manitowoc	Chicago river.
July 18	Str. Victory	Ran aground; rode over her anchor and punctured No. 1 starboard compartment; docked at Cleveland on July 21, repairs completed on July 25; five plates damaged	Point Iroquois.
July 19	Str. Martin Mullen	Collided with Str. Mary C. Elphicke; bulwarks damaged. Elphicke not damaged	Ashland, Wis.
July ..	Str. Ionic	Ran aground; released after lightering	Fawn island.
July 22	Str. H. B. Nye	Ran aground while shifting from one elevator to another; released, uninjured	Duluth.
July 23	Str. C. Russell Hubbard	Stranded; released herself, uninjured	Round island, Straits of Mackinaw.
July 23	Str. Sonoma	Hit by bridge; one anchor broken off, hawse pipe torn out and some plates on starboard side dented	Duluth.
July 23	Sch. C. G. King	Damaged by fire	Outer harbor, Cleveland.
July 23	Str. James Carruthers	Rudder badly twisted; stopped at Sault for temporary repairs, where she left on July 26. Collided with Str. J. S. Ashley	Above the Soo.
July 24	Bge. Granada	Sank at the Hocking dock, having sprung a leak	Toledo, O.
July 24	Tug Fred B	Struck a boulder at mouth of river and went to bottom. Cabins above water	Thunder bay river.
July 25	Str. Minnetonka	Wheel chains parted and she crashed into two launches, doing about $850 worth of damage to them. Broke two buckets off	

Date—Name of Vessel.	Nature of Accident.	Place.
	her wheel	St. Clair river.
July 25 Str. Ward Ames	Collided with Str. G. A. Tomlinson while unloading; damaged gunwale bar	Ore dock, Sault Ste. Marie, Ont.
July 25 Str. G. A. Tomlinson	Collided with Str. Ward Ames; stern slightly damaged	Ore dock, Sault Ste. Marie, Ont.
July .. Str. City of Hamilton	Broke her shaft and lost a trip	Montreal.
July .. Str. Saronic	Machinery became disabled	Off Point Aux Barques, Lake Huron.
July 28 Sch. Eleanor	Ran aground on mud bottom	Hay lake.
July .. Str. Sindbad	Struck; damaged two plates and two frames	Lachine canal.
July 29 Str. Luzon	Struck bottom hard with starboard bilge	McKeller river, Fort William.
July 30 Str. John Sharples	Struck and punctured two plates; temporarily repaired	Lower St. Lawrence river.
Aug. 1 Str. H. W. Smith	Grounded; released on Aug. 2	Mather Shoal, Marquette.
Aug. 2 Str. Lehigh	Carried away two gates of Lock 23, closing navigation for 24 hours. Steamer slightly damaged. Later hit by Sch. Augusta and sent to bottom; floated on Aug. 8, leaked, went to Montreal; stranded again on Aug. 15 at Coteau, third time on one trip; docked for repairs at Ashtabula on Aug. 28; 43 damaged plates	Welland canal.
Aug. 4 Bge. Exile	Collided with unidentified vessel, opening some of her seams; towed to Port Huron	Lake Erie.
Aug. 5 Str. Chas. S. Price	Ran aground near entrance to harbor owing to low water; released on Aug. 6 after lightering	Ashtabula.
Aug. 7 Bge. Crete	Collided with Str. F. B. Squire and sank; tow line of barge thought to have been caught by suction; (in tow of Str. Roumania) floated on Aug. 12 and towed to Erie; constructive total loss. Str. Squire not damaged	St. Clair ship canal.
Aug. 7 Str. Wm. S. Mack	Struck; released herself and reached Detour in crippled condition; shoe and rudder broken off and starboard tanks leaked; temporily repaired at Detour; docked at Ecorse, leaving dock on Aug. 22; 18 plates damaged, new shoe and stern post installed as well as pintle for rudder and four new buckets	Duck island, Lake Huron.
Aug. 7 Str. J. W. Westcott	Struck on Canadian bank	Southeast Bend, St. Clair river.
Aug. 8 Str. North American	Grounded; released by tugs; slightly damaged	Goose island.
Aug. 8 Bge. Uranus	In passing through Superior avenue viaduct had one of her spars taken out	Cleveland.
Aug. 13 Str. Lakeport	Ran ashore in heavy fog; released on Aug. 14	Freschette Pt., Mud Lake.
Aug. 15 Str. Turret Court	Struck and damaged her bow; temporarily repaired	Welland canal.
Aug. 16 Str. Wexford	Ran aground; released after lightering 50,000 bu. wheat. No. 1 and 2 hatches leaked and cargo damaged; temporarily repaired. Docked at Collingwood; 44 plates taken off	Mud lake.
Aug. 16 Str. H. D. Coffinberry	Ran aground; released on Aug. 18, uninjured	Near Detour.
Aug. 17 Str. Atikokan	Steering gear became disabled and she ran on bank	St. Clair river, near Marine City.
Aug. 17 Str. Bickerdyke	Ran ashore in heavy fog; released on Sept. 14	Freschette Pt., Mud lake.
Aug. 17 Bge. Donaldson	Filled with water and sank to bottom	Outer harbor, Cleveland.
Aug. .. Str. Bulgaria	Ran ashore; released on Aug. 21 after lightering 15,000 bu. wheat; reloaded lightered cargo and left Mackinaw for Toledo on Aug. 22nd	Gray's reef.
Aug. 20 Str. Angeline	Struck D. & C. dock, damaging it to the extent of about $200; vessel not injured	Cuyahoga river, Cleveland.
Aug. .. Str. Hamiltonian	Collided with Str. Hamonic; bow considerably damaged; repairs will be made at Kingston and will cost about $4,000	Fort William.
Aug. .. Str. Oscoda	Lost her wheel and ran ashore	Drummond island.
Aug. 21 Str. Beaverton	Struck and damaged her bow; probably repaired at Kingston	Cornwall canal.
Aug. 21 Str. North Land	Steering gear broke; stopped at Detroit for repairs	Lake Erie.
Aug. 23 Str. Iroquois	Hit by Str. Ansonia; 75 ft. of bulwarks aft destroyed and top of boiler house damaged	Montreal.
Aug. 23 Str. Georgia	Ran aground	Off Fish Creek.
Aug. .. Str. Rosemount	Hit Lock No. 2; docked at Kingston Aug. 26	Welland canal.
Aug. 25 Str. Pontiac	Ran ashore; released by tugs, uninjured	Lake Erie near Geneva.
Aug. 26 Str. J. S. Morrow	While coming out of old river bed, hit B. & O. bridge, damaging a spar; went to ship yard for repairs	Cleveland.
Aug. 27 Str. America	Engine went through itself; towed to Manitowoc; will need new cylinder head, connecting rod and crosshead; about two weeks for repairs	Off Mackinaw.
Aug. 30 Str. James Watt	While leaving port, picked up cable in her wheel; diver put to work on her	Duluth.
Sep. 2 Str. A. P. Wright	Ran ashore; released after lightering 15,000 bu. barley; leaked; stopped at Soo for repairs to steering gear and reloaded lightered cargo	Vidal Shoal.
Sep. 3 Str. A. E. McKinstry	Struck; No. 3 tank filled with water and she was beached	St. Lawrence river.
Sep. 2 Str. E. J. Buffington	Bowlder rolled under her bottom, damaging 21 plates; docked at Toledo	Livingstone channel.
Sep. 4 Str. Seeandbee	Cylinder head cracked	Lake Erie.
Sep. 3 Str. City of Naples	Collided with Str. Niagara	Chicago.
Sep. . Str. Panay	Hit a dock; docked at Cleveland Sept. 4 for repairs to her rudder	Duluth.
Sep. . Str. Yorkton	Struck, docked at Ecorse for repairs	Welland canal.
Sep. . Str. H. H. Brown	Trouble with steering gear	Lake Erie.
Sep. 5 Bge. Chickamauga	Sprang a leak and was beached; stopped at Marine City to deliver her coal cargo	Lake Erie.
Sep. . Str. W. B. Schiller	Repaired at Lorain after having hit a bridge and colliding with Str. Midland Queen	
Sep. 7 Str. F. C. Osborne	Ran aground in heavy fog; released	St. Clair river.
Sep. 7 Str. Wissahickon	Ran aground in heavy fog; released	Livingstone channel.
Sep. 7 Str. Midland Prince	Ran aground in heavy fog; released	Livingstone channel.
Sep. 9 Str. Buell	Stranded, released and went to Sturgeon bay for repairs. Hull badly damaged	Off Marinette, Lake Michigan.
Sep. 10 Str. Northern Queen	Stranded, floated on Sept. 12 after lightering; stopped at Port Arthur for temporary repairs; bottom badly damaged. Docked at Superior; 70 plates damaged	Rock of Ages, Lake Superior.
Sep. 10 Bge. Matanzas	Steering gear parted and she ran aground on mud bottom, released after lightering, reloaded lightered cargo. (In tow of Str. F. M. Osborne)	Little Rapids Cut, St. Mary's river.
Sep. 10 Str. Harold B. Nye	Struck east bank, released after lightering 500 tons coal, reloaded lightered cargo	Ballard's reef.
Sep. 11 Str. A. M. Byers	Stranded; released after lightering 1,500 tons coal on Sept. 13, struck a rock after being released and punctured No. 3 tank, began to fill with water and was beached near Amherstburg, temporarily repaired, and went to Green bay	Limekiln Crossing.
Sep. 11 Str. Wm. S. Mack	Collided with a drill boat; neither vessel seriously damaged	Ballard's reef.
Sep. 11 Str. J. J. Albright	Struck on muddy bank; released after lightering 500 tons of ore, not damaged	Detroit river.
Sep. .. Str. Chas. A. Weston	Collided with Str. Conemaugh	Buffalo harbor.
Sep. 11 Str. Niagara	Ran onto rocks in thick weather; released; hull slightly damaged	Rattlesnake island, Lake Erie.
Sep. 12 Str. J. P. Morgan Jr.	Broke a bucket off her wheel; stopped at Port Huron for new one	St. Clair river.
Sep. 12 Tug Annie	Badly damaged by fire; towed to Cleveland for repairs	Fairport.
Sep. 12 Str. James Corrigan	Ran aground; released, after lightering; not damaged	Harsen's island, St. Clair river.
Sep. 13 Str. Capt. Thos. Wilson	Strong wind lowered water and drove her onto a shoal	Canadian Soo.
Sep. 15 Str. L. S. Porter	Collided with Str. Fairfax; sank	Welland canal.
Sep. 15 Str. Fairfax	Collided with Str. L. S. Porter; stem smashed	Welland canal.

Widening Livingstone Channel Entrance

Bids were opened Oct. 2 by Lieut. Col. Mason M. Patrick, Corps of Engineers with headquarters at Detroit, for widening the upper entrance to the Livingstone channel, opposite Ballard's reef. There is a considerable current running at this point, and vessels have to maneuver with great caution to enter the channel. The dotted line on the accompanying map shows the present channel, and the broken line shows to what extent it is intended to widen it. The map also shows the dykes that were proposed below the dry cut of the Livingstone channel to control the cross currents running there. The citizens of Amherstburg entered a strong protest against the dyke extending diagonally from the east side of the Livingstone channel on the ground that it would create a dangerous current in the Amherstburg channel, would result in bank erosion, and cause the sewage of the river to flow in that direction. The subject was taken up by the International Joint Commission, which recommended a dyke on the west side of the Livingstone channel below the dry cut which is given on the accompanying map as proposed dyke No. 3. This dyke will be constructed and it is proposed to dump some of the material from the widening at the upper entrance of the Livingstone channel along the axis of this proposed dyke. The work will be paid for out of the unexpended balance of the appropriation for the construction of the Livingstone channel.



The Michigan Alkali Co., Detroit, has placed an order with the Great Lakes Engineering Works, Detroit, for an 8,000-ton steel steamer to be used in the stone trade. The dimensions of the steamer are 436 ft. keel, 56 ft. beam and 30 ft. deep, equipped with quadruple-expansion engines and Scotch boilers. She will be equipped with discharging apparatus designed to unload her in eight hours or at the rate of 1,000 tons per hour.

It is announced that Pickands & Co. intend to extend the coal dock at Marquette, Mich. The plans call for rebuilding the present dock to a width of 45 ft. for a distance of 500 ft. at a cost of about $100,000. Two Mead-Morrison unloading towers will be installed.

Construction work on the new 600-ft. extension to the Reiss Coal Co. in St. Louis bay, Duluth, has been started and when completed will double the capacity of the dock. The Wales & Campbell Co., Duluth, are the contractors.

The Pittsburgh & Conneaut Dock Co. is equipping an electric repair shop on its docks at Conneaut. The new building is 48 x 96 ft., of reinforced concrete construction.

The Cleveland Steamship Co., John Mitchell, Cleveland, manager, has declared a quarterly dividend of 1½ per cent, payable Oct. 1.

The directors of the Interlake Steamship Co., Cleveland, have declared a quarterly dividend of 2 per cent, payable Oct. 1.